1 JUNE 1961

ONE SHILLING AND SIXPENCE

ELECTRICAL TIMES

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Cable & warping capstan motors, store & baggage hoist motors and cargo winch motors—Clarke, Chapman & Co., Ltd;

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Carron cargo transporter motor—Bruce Peebles & Co., Ltd & The Carron Company;

Power cables—A.E.I. Ltd., Cables Division;

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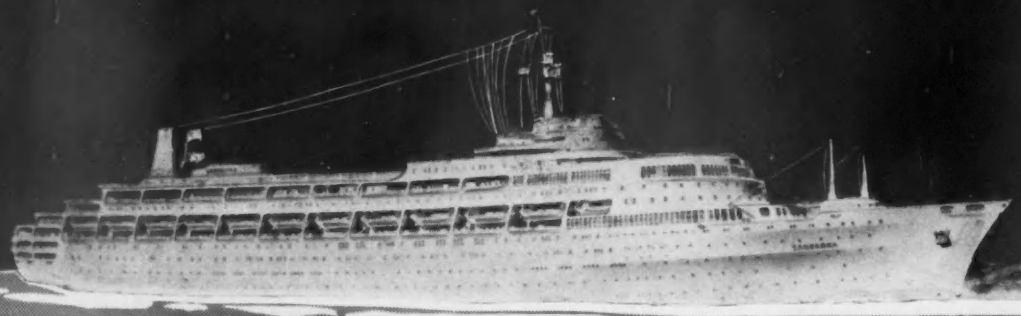
. . . all incorporate insulation by M & I



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THE MICANITE & INSULATORS CO., LTD., Empire Works, Blackhorse Lane, Walthamstow, London, E17

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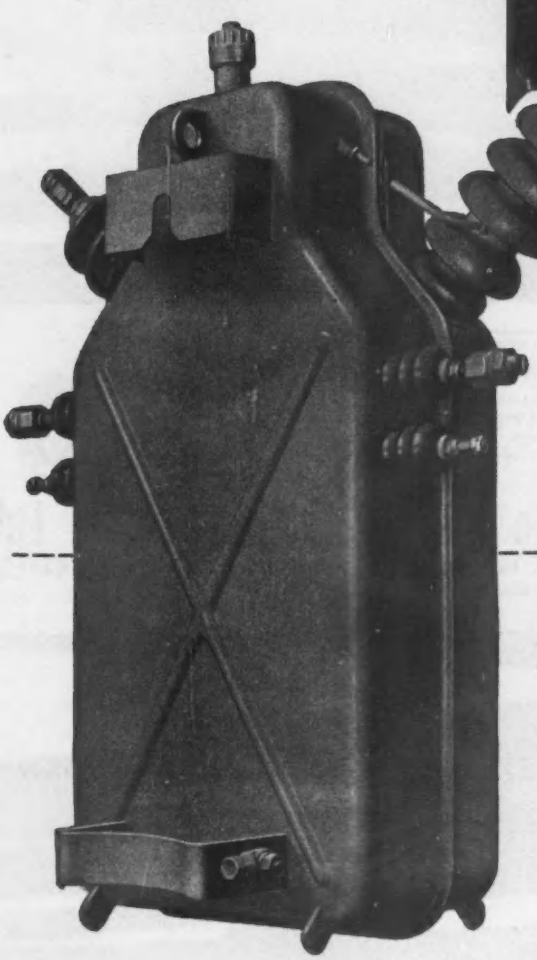

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'ENGLISH ELECTRIC'

rural transformers

The English Electric Company Limited, English Electric House, Strand, London, W.C.2

TFL.47A

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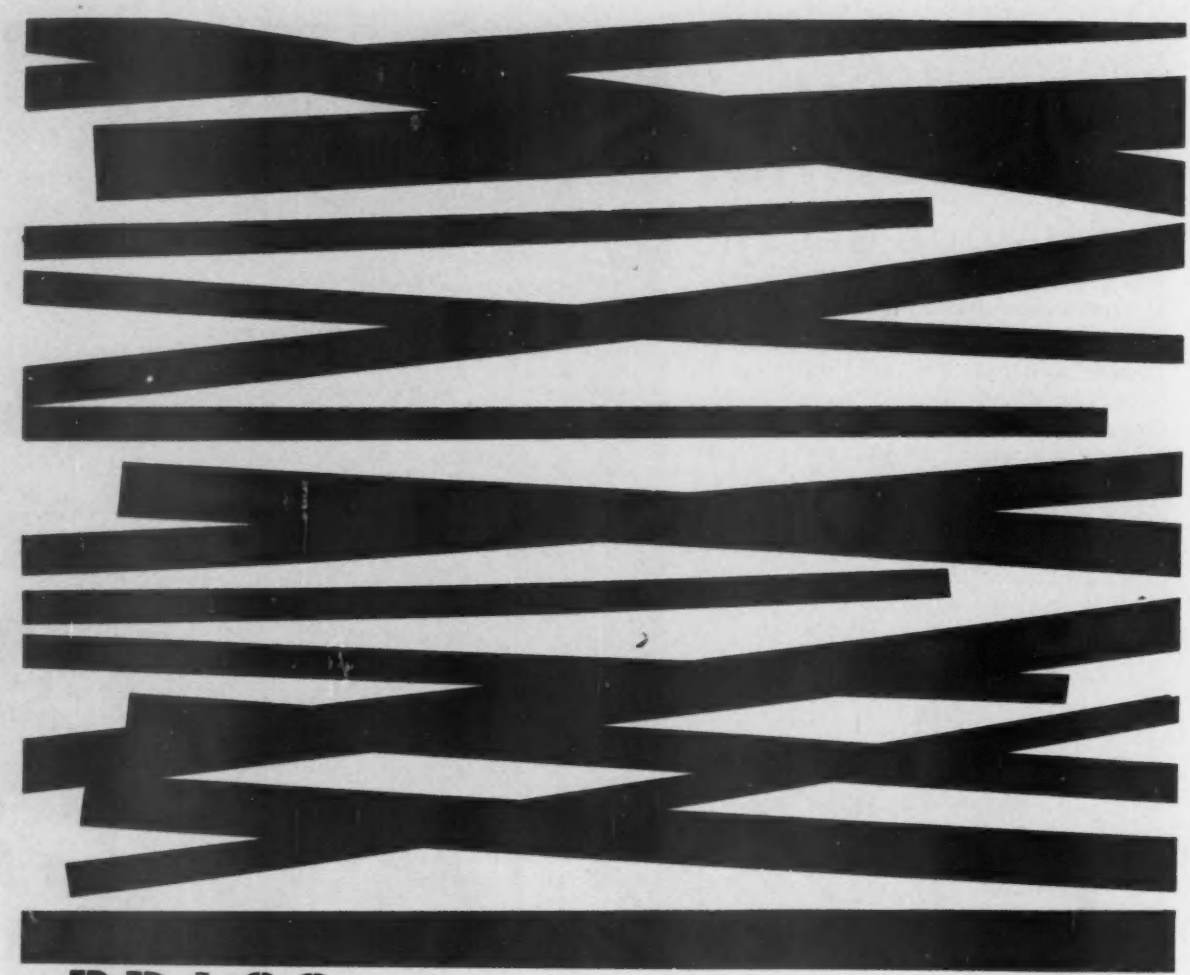

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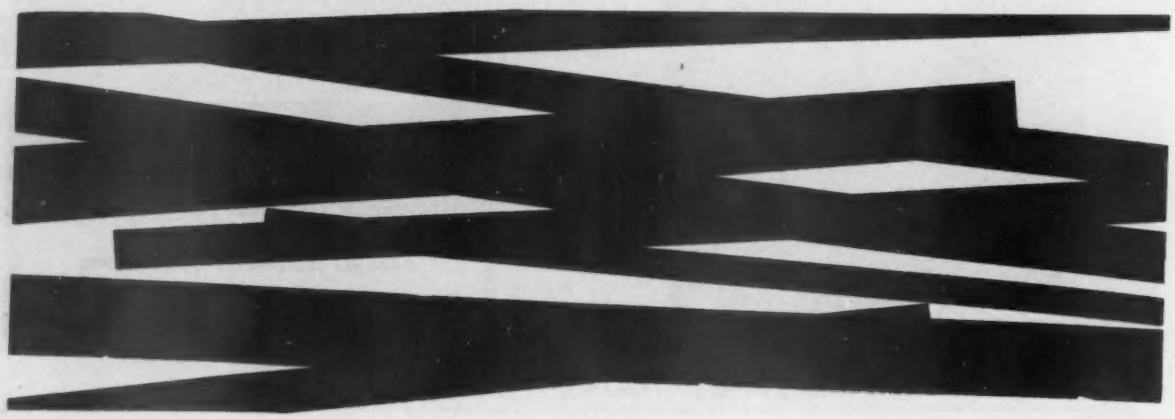

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M.W. 128

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LOADMASTER distribution boards are correspondingly reduced

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Available in 10 current ratings 5, 10, 15, 20, 25, 30, 35, 40, 50 and 60 amp.. Thermal/magnetic tripping. Ambient compensated. Universal screw fixings.

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Fully interlocked " switch-only " version of LOADMASTER. Provides integral 60 amp. isolators for all LOADMASTER distribution boards.

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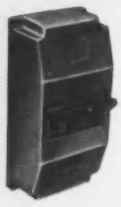

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Available for surface or panel mounting of S.P., D.P. and T.P. units. Suitable for front or back entry. Sheet steel backplate available for D.P. and T.P.

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Heavy duty, fully gasketted cast boxes. Available S.P. & N. and D.P./T.P. and N.

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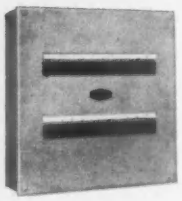

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Range, 4 to 12 T.P. & N. ways or 12 to 36 S.P. & N. ways in three " box " sizes. Flush or surface types. Lockable hinged covers available.

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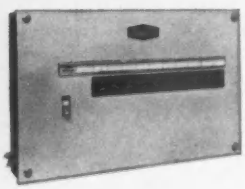
T.P. and N. LOADMASTER distribution boards combined with 60 amp. or 150 amp. Dorman type " TS " fused switches. Range, 4 to 12 T.P. and N. ways or 12 to 36 S.P. and N. ways.



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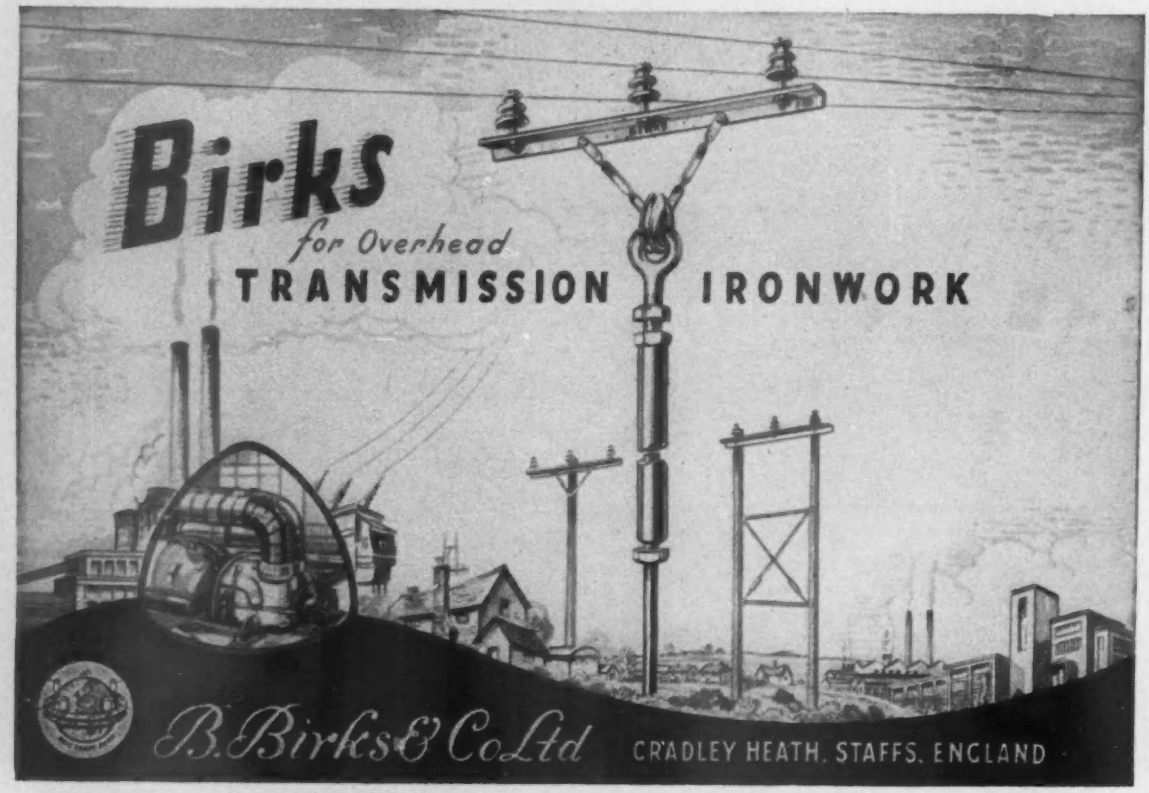

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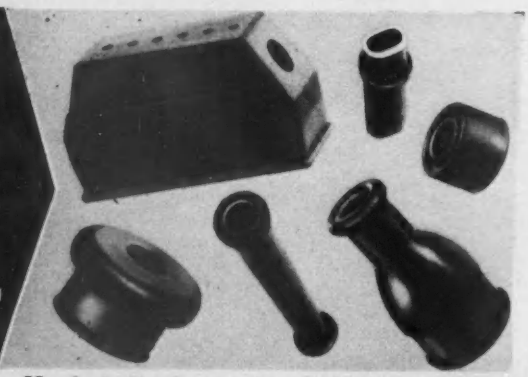

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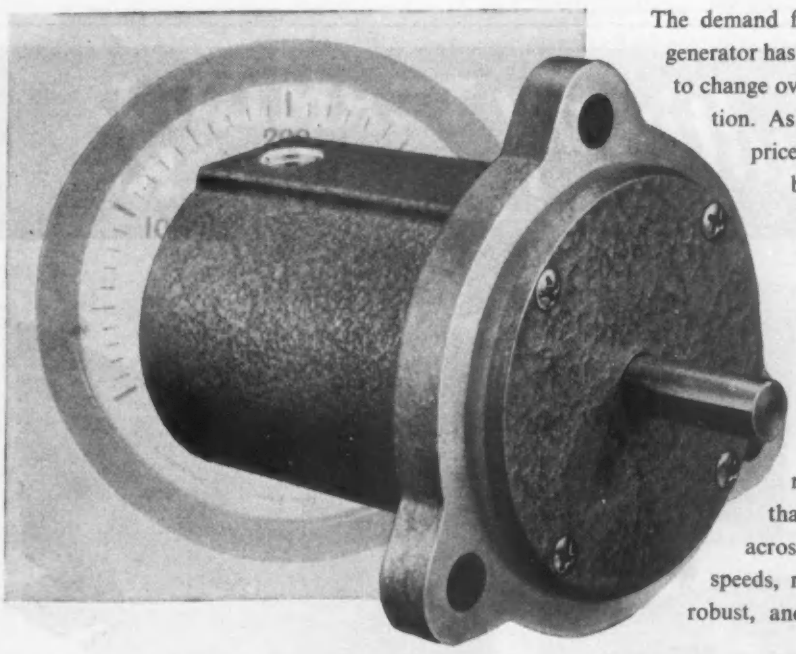
Up to 30% OFF

Crompton Parkinson

Tachogenerator prices



The demand for the Crompton Parkinson tachogenerator has been so great that it has been possible to change over to more fully mechanised production. As a result we have been able to cut the price of foot and flange mounting models by about 30% and to make substantial reductions in the prices of other types. Some necessary modifications in shape and size have been made, with the result that all models are more compact than before. But the essentials of their design are unchanged. C.P. tachogenerators are still 3-phase A.C. units—with no brushgear or sliding contacts—that provide a steady rectified voltage across the indicator even at very low speeds, run smoothly on a low torque, are robust, and completely reliable.

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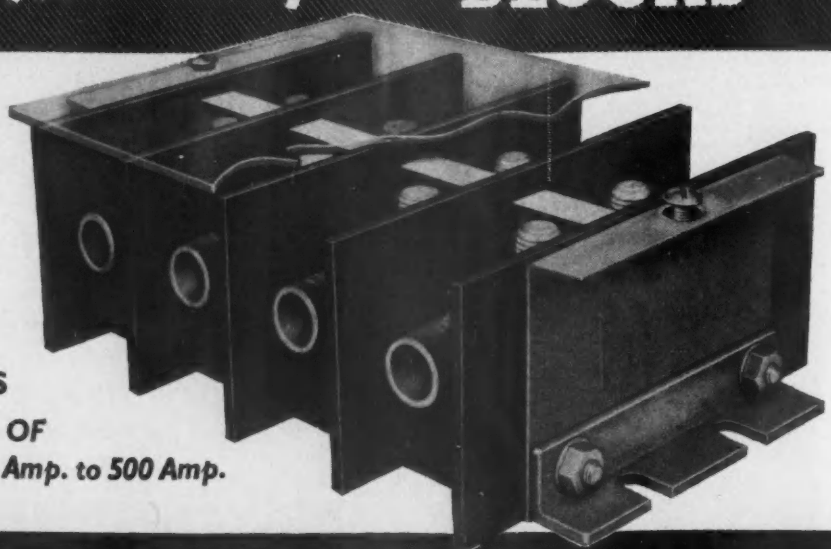

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120, 200, 300 and 500 Amp.
Ratings

WITH SOLID OR REMOVABLE LINKS

STANDARD RANGE OF TERMINALS FROM 15 Amp. to 500 Amp.

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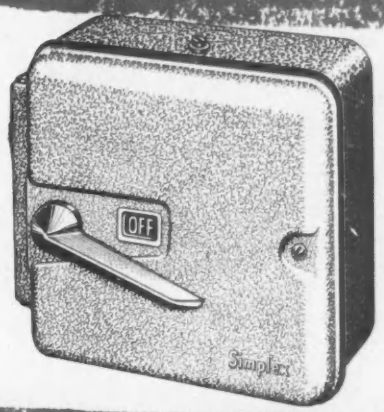
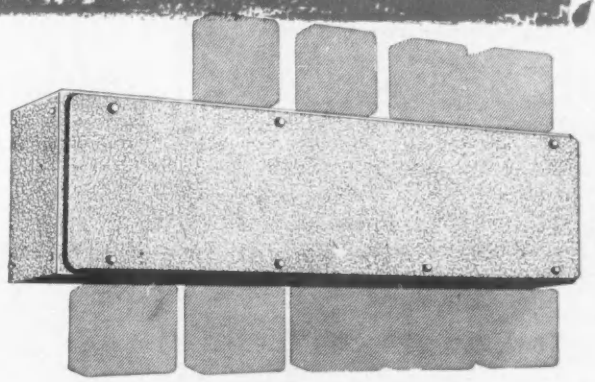
Simplex Star Switchgear



Simplex Star Switchfuse. Strong pressed steel case. Superbly styled.

Star Switchfuse with cover open showing interior hinged forward for ease of wiring.



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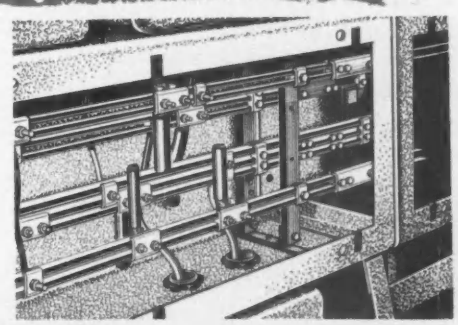


Star Busbar Chamber.

Close up of interior of Star Busbar Chamber showing main branch terminals, and busbar arrangements.

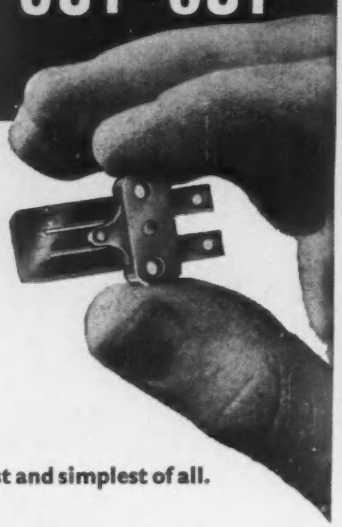
Cables cut away for purpose of illustration

S.2.

NEW

Otter REGD. 'PUP'

Safety CUT-OUT



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* Easily the safest and simplest of all.

* Has only one moving part.

* Patented "Otter" snap action.

* They PRESS their contacts together to open them with a snap!

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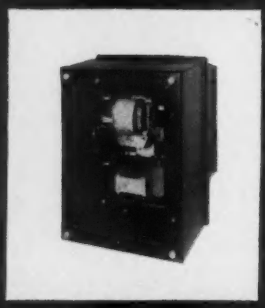

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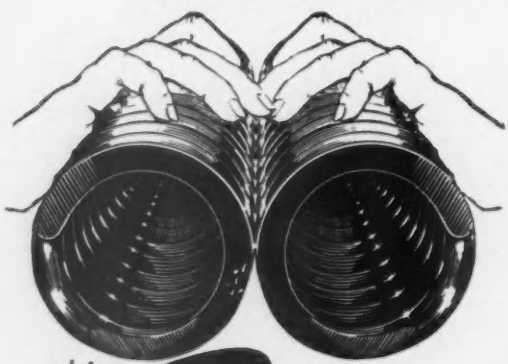

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Crawford Spring Works, Norman Road, Rochdale

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- *Cut labour costs by 50% !*
- *Cut paint consumption 25% !*
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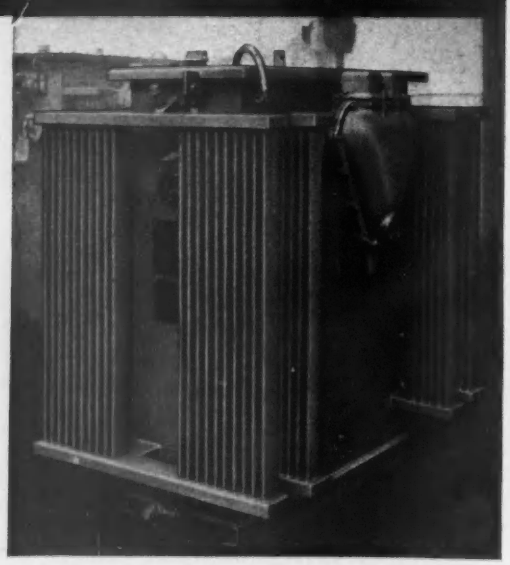
"I CAN ONLY JUST HEAR IT"

"NATURALLY, IT'S THE BRUSH **T1**"

The low noise level of the present range of Brush T.I Distribution Transformers has to be heard to be really believed—and that's not the only advantage. Their **compactness** *is surprising too. The British T.I. series will be particularly appreciated by authorities who find it necessary to increase output of their existing transformer sub-stations to meet increasing demands for power, without carrying out major alterations to buildings. A modern Brush 500 kVA transformer can be placed in a sub-station building originally designed for a 300 kVA transformer, and with room to spare!*



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BRUSH ELECTRICAL ENGINEERING CO. LTD · LOUGHBOROUGH · ENGLAND

NEWS SHEET

South East shut-down on 15 May initiated by c.b. at Wimbledon opening on overload due to misunderstanding on trip setting. Disturbance travelled via Northfleet, tripping c.b's at Chichester and Deptford West, isolating the area, committee of inquiry finds. Closer study of networks recommended, also automatic shedding of load on frequency drop and better liaison between technical and operating staff. (859, 869)

CEGB £2m. nuclear laboratories, Berkeley, opened; will work for better nuclear station efficiency. Particular attention to fuel element behaviour, graphite phenomena and heat transfer. (859, 871)

Domestic appliance exhibition proposed for August, 1962, at Olympia by subsidiary of Electrical Engineers' Exhibition. Reaction sought. (886)

Welded sheet aluminium lamp columns resist impact better than concrete or steel, claims Midland manufacturer. Greater corrosion resistance to aggressive atmospheres and salt spray, with lower weight. (879)

Cross-Channel link in commercial operation by December, predicts CEGB. Laying this week of British section of 100 kV d.c. twin cables follows successful laying of French cables last week. 160 MW link, if successful, likely to be supplemented by further cables. (860, 877)

GEC stand fast on resale price maintenance, in launching ten new appliances. (884, 886)

Australian experience with heavy neutral loading from fluorescents reported. Neutral currents up to 80% balanced phase currents found in some office building branch circuits, up to 55% in mains. (868)

More flexible financing for DSIR as former five year planning for expenditure gives place to one year agreed firm, and reasonably firm estimates for next two years. Expenditure 1960-61, £2m. up at £12·2m. (888)

Discovery of carbon dioxide polymers by UKAEA pertinent to reactor coolant studies. May be significant in interaction of carbon dioxide with graphite in AGC systems. (886)

PEOPLE—W. J. Jones retiring end June . . . E. J. Counter to be ELIC director, A. Wilcock BLC director . . . J. S. A. Bunting joins board of AEI (Woolwich) . . . In other AEI Cable Div. changes E. J. Vidler becomes div. general manager; F. V. Vaissiere, div. commercial manager; V. L. J. Plascott, div. manufg. manager; and W. G. Hawley div. chief engineer, with four sales managers named . . . Dr J. Taylor joins Pyrotenax board . . . A. E. Henbest promoted southern area manager, A. Armitage northern area manager, Nettle Accessories . . . A. W. Thomson becomes technical manager, BICC-Burndy . . . A. R. Norman promoted to marketing manager, AEI-Hotpoint, portable appliances. (874-876)

"I CAN ONLY JUST HEAR IT"

"NATURALLY, IT'S THE BRUSH T1"

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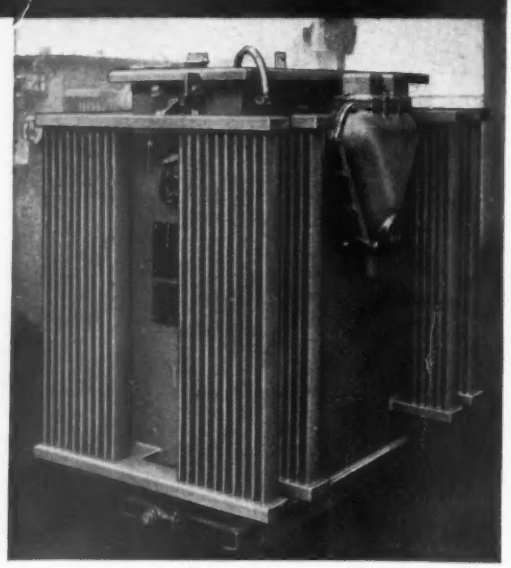

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NEWS SHEET

South East shut-down on 15 May initiated by c.b. at Wimbledon opening on overload due to misunderstanding on trip setting. Disturbance travelled via Northfleet, tripping c.b's at Chichester and Deptford West, isolating the area, committee of inquiry finds. Closer study of networks recommended, also automatic shedding of load on frequency drop and better liaison between technical and operating staff. (859, 869)

CEGB £2m. nuclear laboratories, Berkeley, opened; will work for better nuclear station efficiency. Particular attention to fuel element behaviour, graphite phenomena and heat transfer. (859, 871)

Domestic appliance exhibition proposed for August, 1962, at Olympia by subsidiary of Electrical Engineers' Exhibition. Reaction sought. (886)

Welded sheet aluminium lamp columns resist impact better than concrete or steel, claims Midland manufacturer. Greater corrosion resistance to aggressive atmospheres and salt spray, with lower weight. (879)

Cross-Channel link in commercial operation by December, predicts CEGB. Laying this week of British section of 100 kV d.c. twin cables follows successful laying of French cables last week. 160 MW link, if successful, likely to be supplemented by further cables. (860, 877)

GEC stand fast on resale price maintenance, in launching ten new appliances. (884, 886)

Australian experience with heavy neutral loading from fluorescents reported. Neutral currents up to 80% balanced phase currents found in some office building branch circuits, up to 55% in mains. (868)

More flexible financing for DSIR as former five year planning for expenditure gives place to one year agreed firm, and reasonably firm estimates for next two years. Expenditure 1960-61, £2m. up at £12·2m. (888)

Discovery of carbon dioxide polymers by UKAEA pertinent to reactor coolant studies. May be significant in interaction of carbon dioxide with graphite in AGC systems. (886)

PEOPLE—W. J. Jones retiring end June . . . E. J. Counter to be ELIC director, A. Wilcock BLC director . . . J. S. A. Bunting joins board of AEI (Woolwich) . . . In other AEI Cable Div. changes E. J. Vidler becomes div. general manager; F. V. Vaissiere, div. commercial manager; V. L. J. Plascott, div. manufg. manager; and W. G. Hawley div. chief engineer, with four sales managers named . . . Dr J. Taylor joins Pyrotenax board . . . A. E. Henbest promoted southern area manager, A. Armitage northern area manager, Nettle Accessories . . . A. W. Thomson becomes technical manager, BICC-Burndy . . . A. R. Norman promoted to marketing manager, AEI-Hotpoint, portable appliances. (874-876)

NEWS SHEET

First British a.c. passenger liner *Canberra* starts maiden voyage this week. 7,500 kVA, 440 V, three-phase unearthed system gives 230 V supplies from s.p. transformers to limit fault current (861). Propulsion units of double motor construction enable each turbine to serve both propellers in synchronism. (860, 864)

Power lines to upper Borrowdale to be mainly underground, MoP decides, but o.h. route sanctioned for short length from Longthwaite and in Seatoller. (886)

14% increase in units sold by S Scotland EB for April; NSHEB 9·4% while CEGB increase only 7·2%. Total output capacity for UK now 29,888 MW but no new plant commissioned during month. (885)

Under-turf heating at Harringay greyhound stadium has 270 kW total loading, used for frost protection. Similar installations planned for Belle Vue and White City. (889)

Electrical exports in April, £24·9m., nearly £1m. down on March. Netherlands took £1m., over half for radio and electronic gear. Imports £5·3m., again with US largest supplier. (881)

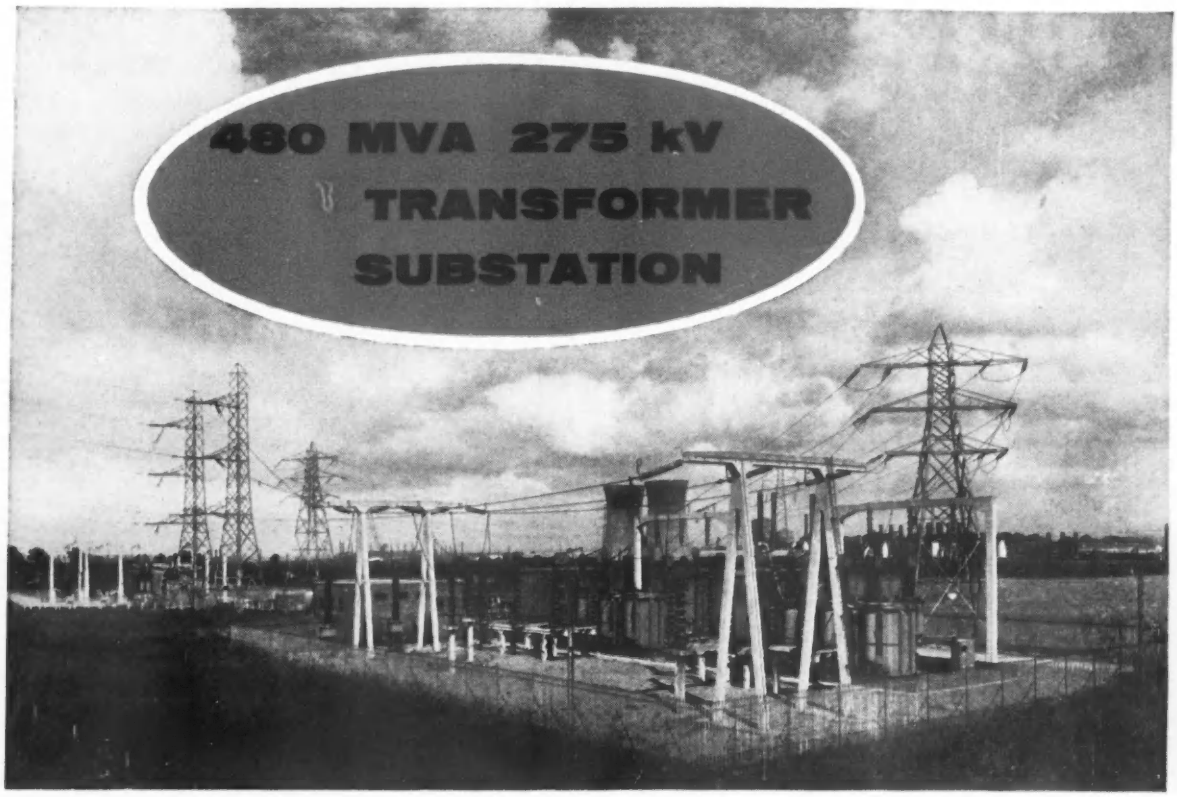
A. J. Flatley advertise for deposit money at 10% to add to working capital. Possible application for Stock Exchange listing. Two new appliances planned, 2 cu ft refrigerator and sink disposal unit. (887)

Fast transformer protective relay unaffected by inrush current introduced by GEC. Incorporates second harmonic filter circuit and compensates for tap-changing range of +15% to −20%. (870)

Market research committee to advise on performance standards suggested at BSI/IPE conference. Register of Standards Associates is 300 at end of first year. (880)

BUSINESS—Stella Radio and TV to market Ada domestic appliances (887) . . . Ultra Electronics buy the Trix sound amplification business (887) . . . English Electric Co. make £2m. bid for W. H. Dorman and Co. (886) . . . Edwards High Vacuum plan rights issue . . . Influx of orders for Harland Engineering . . . Simon Engineering pays 27½% in its first year, equivalent to 41¼% when compared with 35% paid by Simon-Carves and Henry Simon before merger . . . Burco Dean cut interim from 5% to 3½% but all subsidiaries operating profitably . . . Reliance-Clifton Cables lift dividend on higher profit . . . Allen West rights issue soon. (894)

OVERSEAS—HEPC of Ontario considering pumped-storage plan . . . British Guiana Electricity Commission to expand in rural areas . . . First output from India's heavy electrical manufacturing project this month . . . Tasmanian thermal power plan to save coal industry. (892, 893)



With its four 120 MVA auto-transformers the Clyde's Mill substation of the South of Scotland Electricity Board was the first in Scotland to come into service on the 275 kV grid.

RECENT CONTRACTS INCLUDE

Four 240 MVA 275/132 kV auto-transformers for the Windyhill and Neilston transmission substations of the South of Scotland Electricity Board.

Two 225 MVA 16/285 kV generator transformers, the largest double-wound transformers so far ordered for Scotland, for the Kincardine-on-Forth power station of the South of Scotland Electricity Board.

Four 30 MVA 220/66 kV transformers and seven 15 MVA single-phase units to form two 45 MVA 220/22 kV three-phase banks (one spare unit) for the State Electricity Commission of Victoria.

Two 90 MVA 275/33 kV transformers for the Ravenscraig substation of the South of Scotland Electricity Board.

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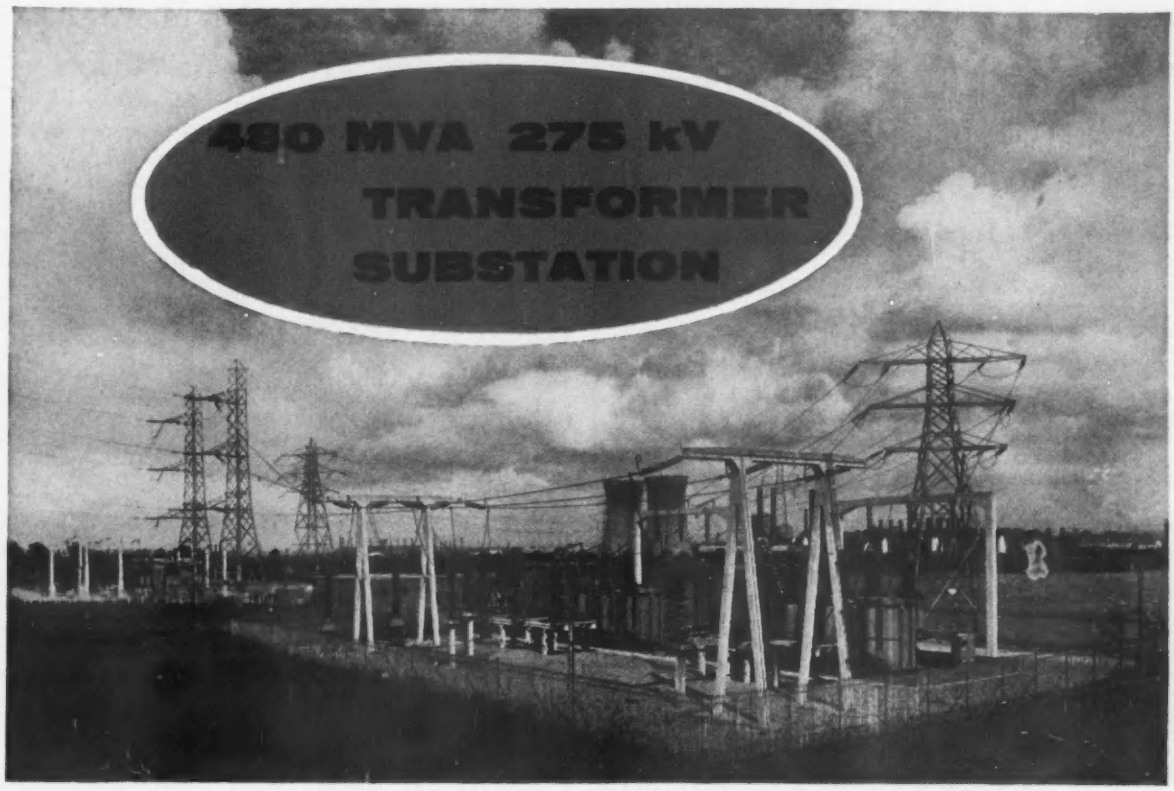

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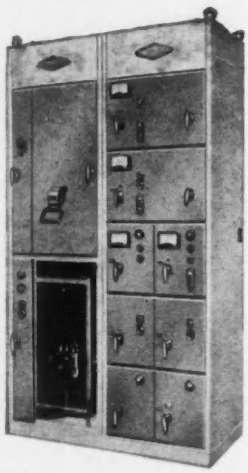

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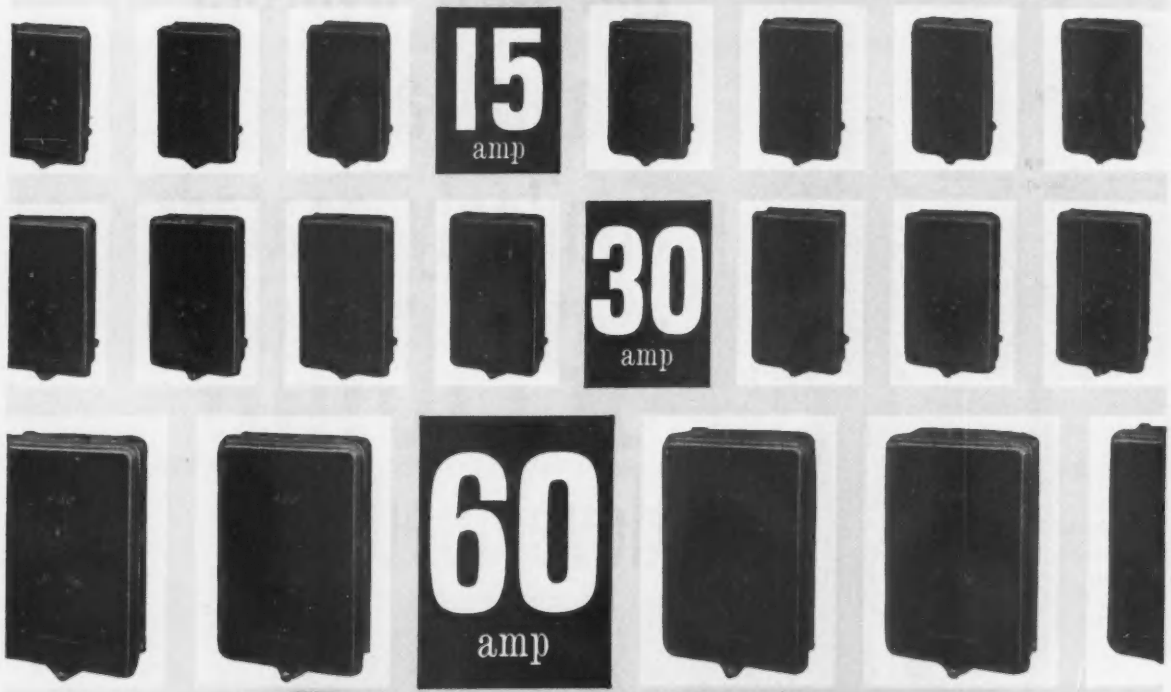

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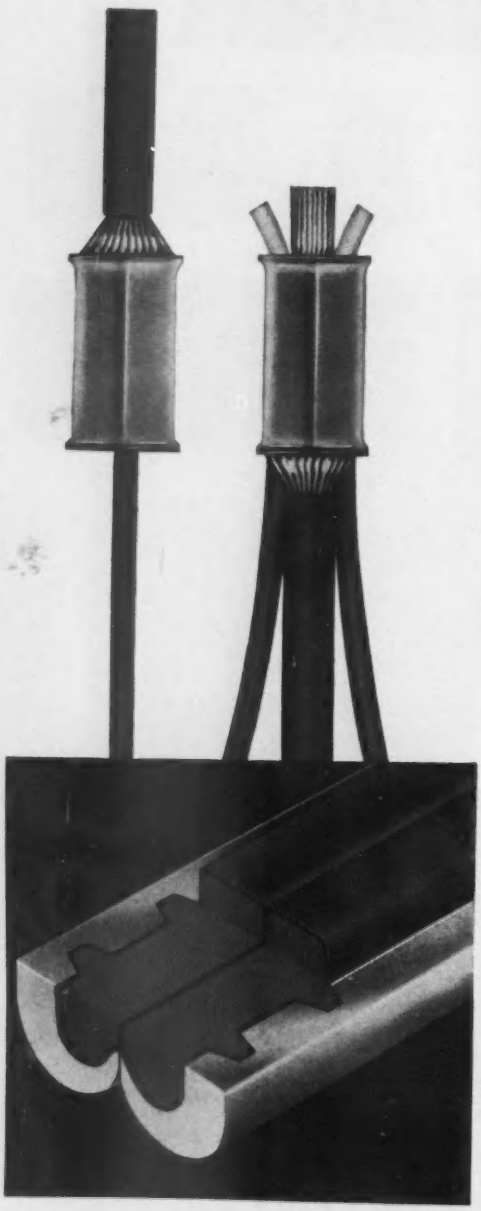

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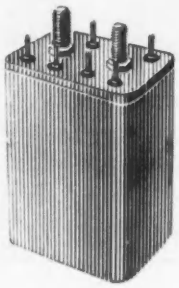


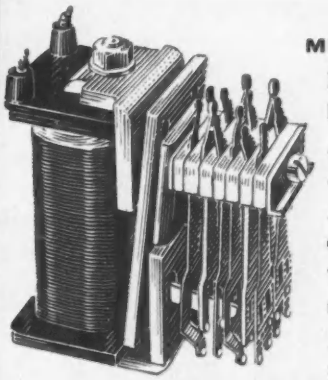
MINIATURE TYPE CA

Fully Type Approved to RCS 165 and 166.

Light and medium duty types have two changeover contacts.

Heavy duty types single make or break.

Available sealed, or unsealed with dustcover.



MINIATURE TYPE CB

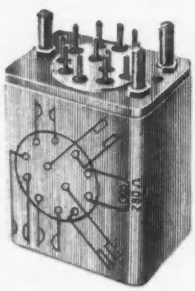
Based on Type CA with heavier magnetic circuit.

All versions fully Type Approved.

Available with up to twelve contact springs.

Twinned platinum contacts on light duty versions.

Available sealed, or unsealed with dustcover.



MINIATURE TYPE CC

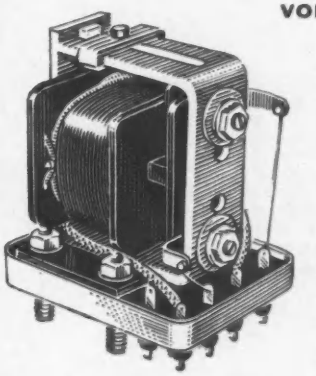
Meets RCS 165 and MIL-R-5757 Specifications.

Based on Type CA magnetic circuit, providing up to four light or medium-duty contact sets.

Available sealed, or unsealed with dustcover.

Printed circuit versions available.

Contact loadings up to 10A d.c., non-inductive, can be arranged for Types CA, CB, and CC.



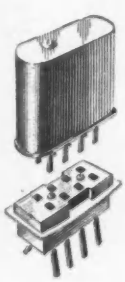
VOLTAGE REGULATING TYPE XC 269

Fully Approved to S.R.D.E. Spec. 166/1.

Temperature compensated in range −40°C to +85°C.

Available for 6, 12 or 24 V operation.

Typical changeover voltage differential 1 V in 24 V.



SUB-MINIATURE TYPE CE

Occupies less than ¼ square inch of chassis area.

Two changeover contacts rated 0.25A at 28 V d.c.

Insulation proof against 500 V a.c., r.m.s. between coil and contact stack.

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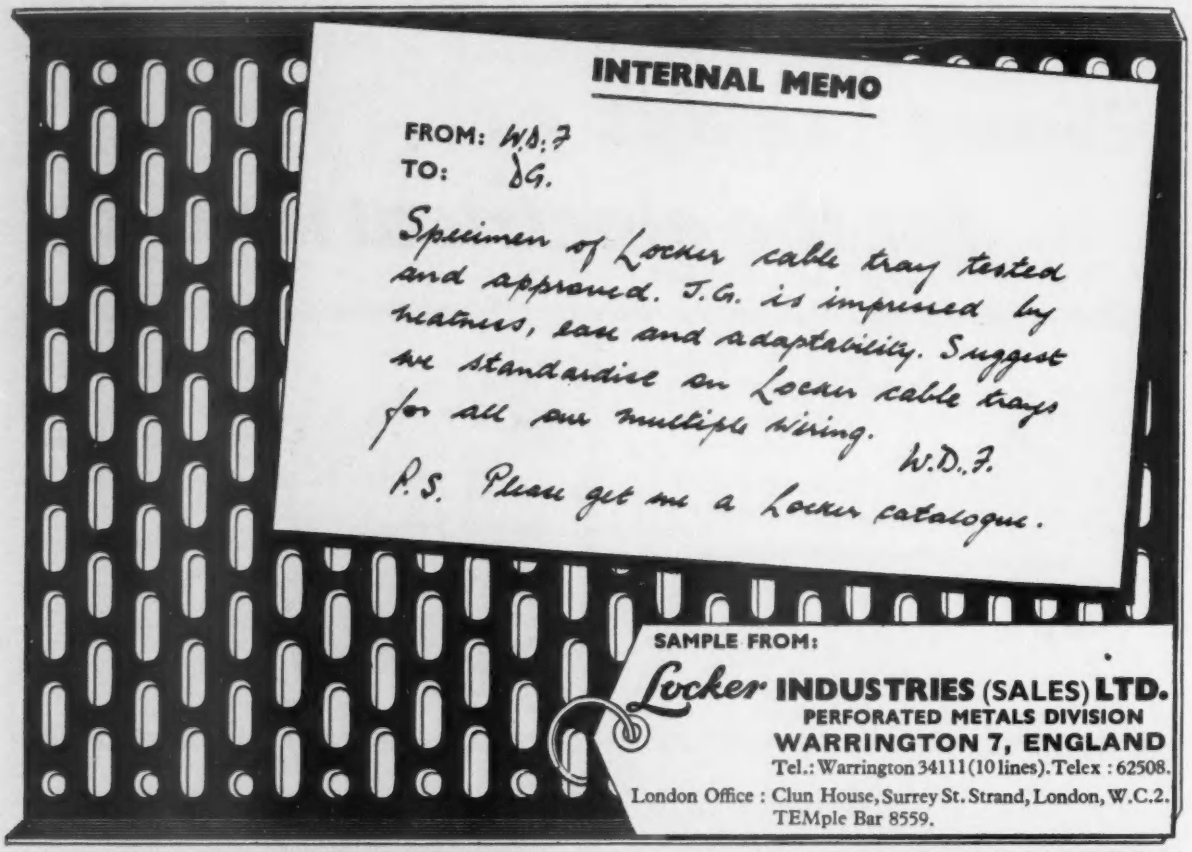
RCS 2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TO: J.G.
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W.D.F.
P.S. Please get me a Locker catalogue.

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because the same grommet can be used with
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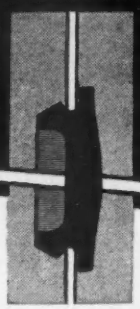

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Any one size will not only accommodate itself to a variety of mounting plate thicknesses, but (designed for cable or control rod) will take these in a variety of sizes and be weather-, water- and dust-proof at a variety of angles to the cable or rod.

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THE NEW BLIND GROMMET

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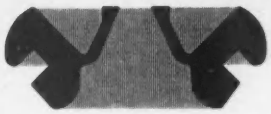

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THE NEW DESIGNED GROMMET

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Note how when sprung into position the grommet provides a perfect double seal by its own permanent pressures. The angled groove also creates a tight pressure hold on the metal plate.

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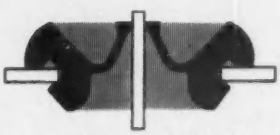
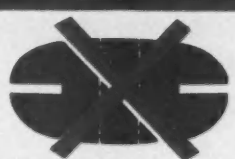


A useful feature of this cable grommet is that by reason of the designed taper of the cable entry and the flexibility of the web, a considerable angle of cable entry and a variety of cable size are possible. This avoids necessity for special grommets with angled bores.



In the conventional grommet, only one thickness of plate and only one size of cable can be accommodated. No effective seal is afforded by the parallel groove.

Now being produced in a range of sizes.

THESE GROMMETS WILL SOLVE YOUR SEALING PROBLEMS.

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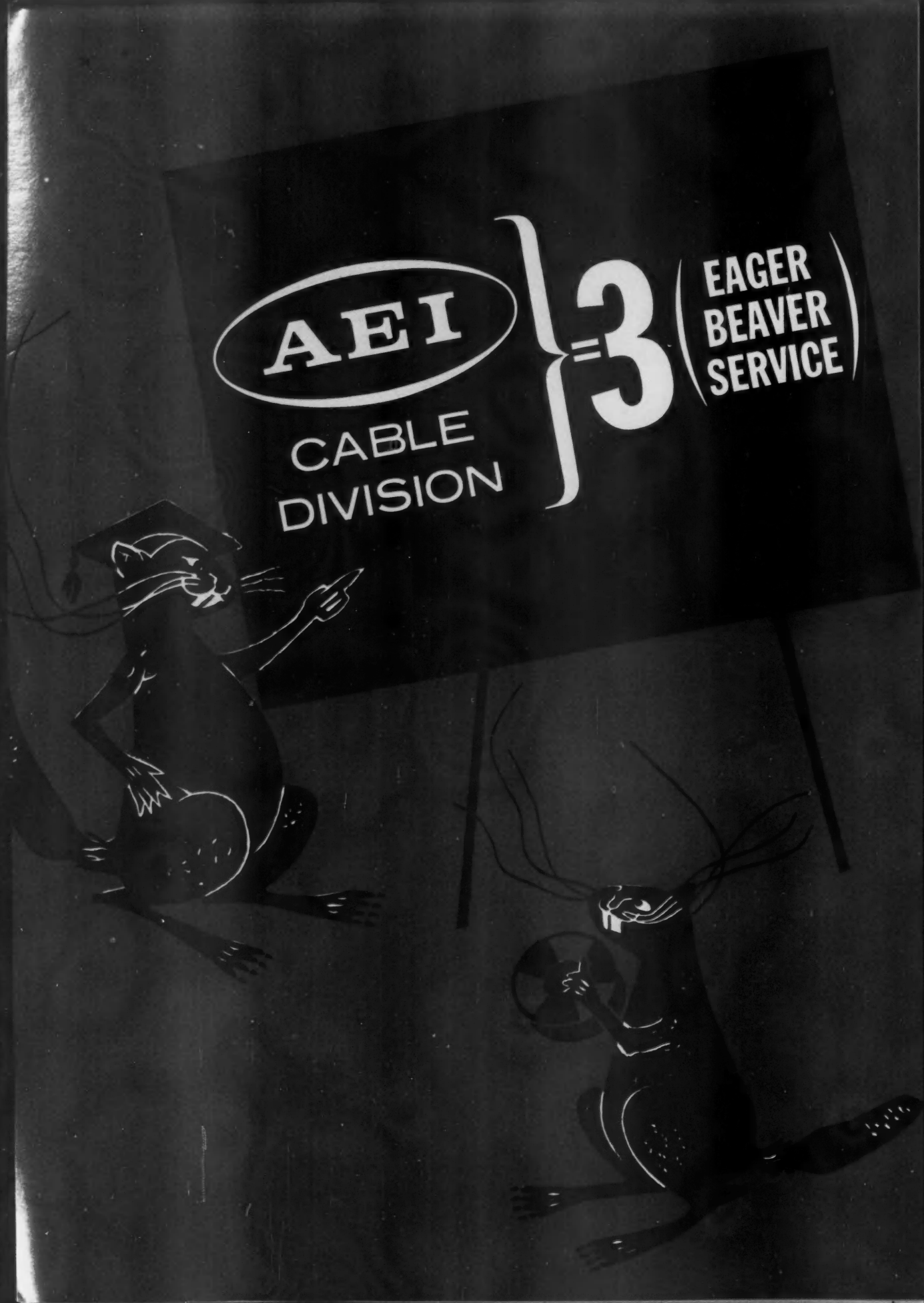
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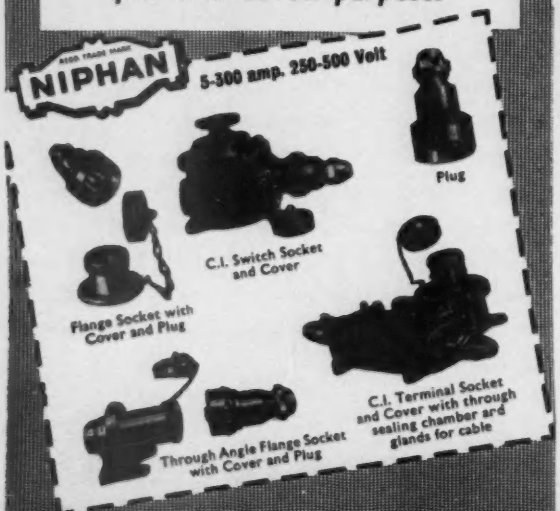
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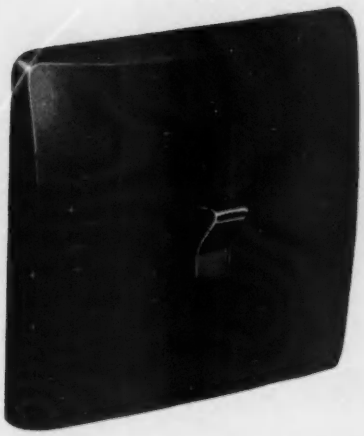

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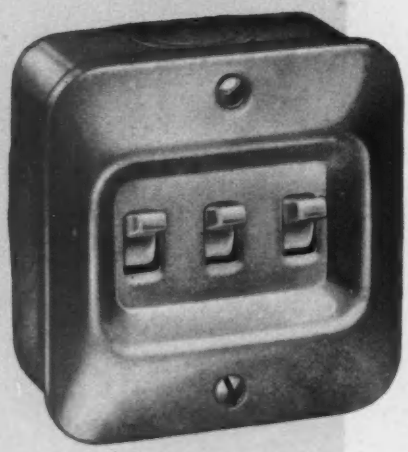

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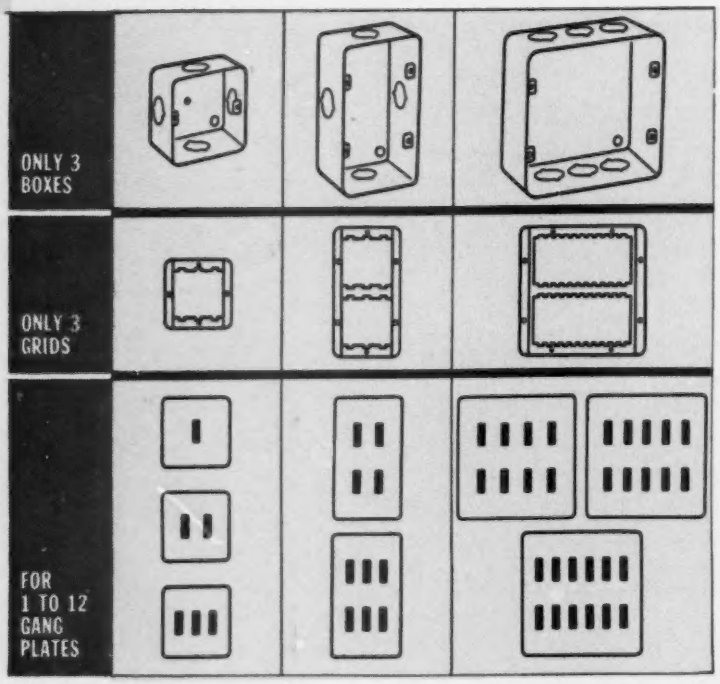

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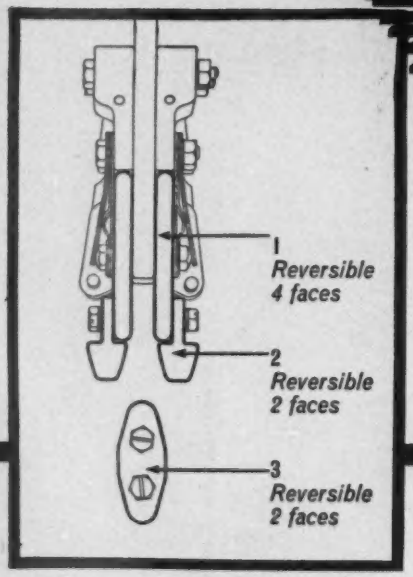

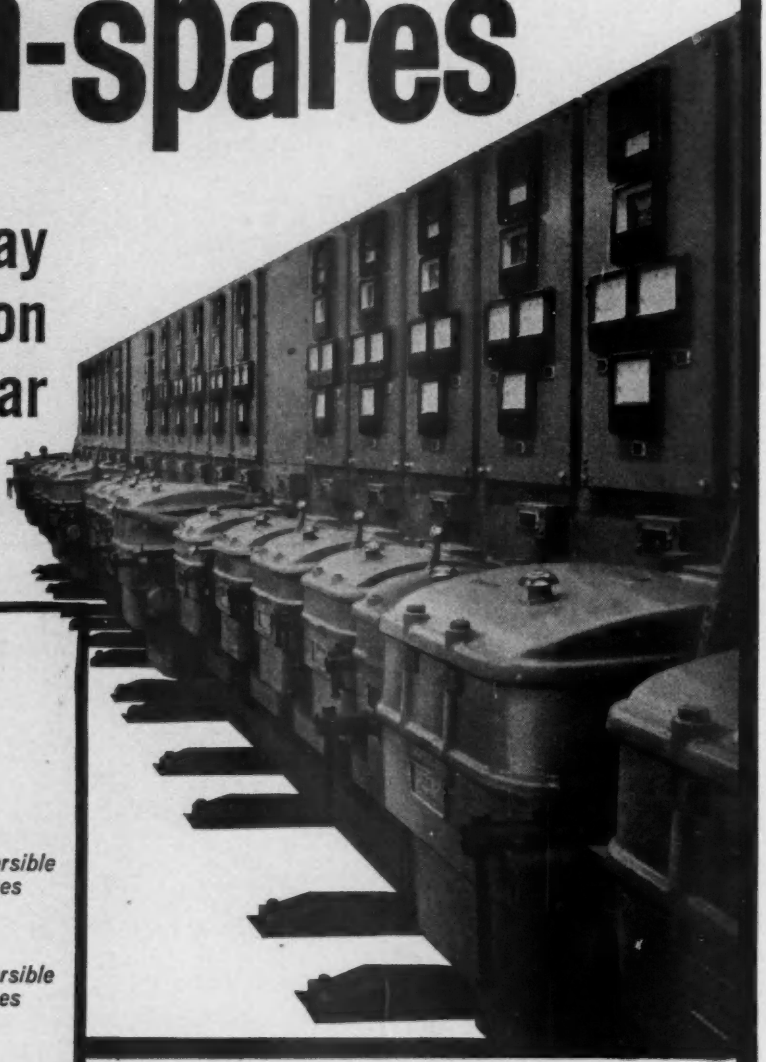

Did you know that the Ellison GEO switchgear has *built-in-spares?*

All contacts on the 400, 600, 800, 1200 and 1600 amp size circuit breakers are interchangeable and reversible—the arc contacts in a matter of minutes.

This is but one of the easy maintenance features that characterise Ellison GEO switchgear. May we send you further information?

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867

THURSDAY 1 JUNE, 1961
Registered as a Newspaper Volume 139 No. 22

Dans ce numéro

"Canberra" **861**

Le "Canberra", paquebot de 45.000 tonnes à groupe propulsif turbo-électrique comporte les plus puissants moteurs synchrones de propulsion qui aient été jusqu'ici installés dans un navire. C'est le premier navire dans lequel les chaudières et l'équipement turbo-électrique ont été installés à l'arrière, et le premier navire britannique ayant un système électrique entièrement alternatif. Les groupes de propulsion de 43.000 ch sont remarquables du fait qu'ils comprennent deux moteurs dans un même cadre. Dans certains cas, chacun des turbo-alternateurs peut alimenter un moteur de chaque groupe. Le système de distribution du courant alternatif, obtenu depuis quatre turbo-alternateurs auxiliaires de 1.875 kVA, est de 440V triphasé, sans mise à la terre. Les alimentations de 230V, monophasé, ne comportent pas non plus de mise à la terre.

Amélioration des centrales nucléaires **871**

Les services britanniques d'alimentation électrique procéderont bientôt, aux laboratoires récemment inaugurés dans l'ouest de l'Angleterre, à des recherches visant à améliorer le fonctionnement des centrales nucléaires. Les éléments combustibles des centrales nucléaires seront amenés aux laboratoires dans des gaines blindées très épaisses, et soumis à des examens métallurgiques et chimiques. D'autres travaux de recherche se porteront sur le transfert de chaleur depuis les éléments combustibles et les variations dans le graphite sous l'influence des irradiations nucléaires.

Câble reliant le Royaume-Uni à la France **877**

Un câble de 24 km de longueur, à isolement papier, et prévu pour une tension de 100 kV continu par rapport à la terre, a été chargé à bord d'un câblier qui le posera dans la Manche. Le câble sera ultérieurement relié, à mi-distance entre les côtes, à un autre câble fabriqué en France et posé par un câblier français.

In dieser Nummer

"Canberra" **861**

Der turbo-elektrische 45000 Tonnen-Dampfer "Canberra" wird von den stärksten jemals in ein Schiff eingebauten Synchronmotoren angetrieben. Sie ist der erste Ozeandampfer, bei dem die Kessel und die turbo-elektrische Ausrüstung im Heck eingerrichter wurden und der erste britische Dampfer mit einem durchweg elektrischen Wechselstromsystem. Die 43000 PS starken Triebeinheiten sind bemerkenswert, da sie zwei in einm gemeinsamen Gestell angeordnete Motore enhalten. Manchmal kann jeder der Turboalternatoren einen Motor je Antriebsheinheit mit Strom versorgen. Das Wechselstrom-Bordnetz wird von vier 1875 kVA Hilfsturboalternatoren gespeist und arbeitet mit einer 440V Dreiphasenspannung und ohne Erdung. Einphasige 230V Anschlüsse sind ebenfalls ungeerdet.

Verbesserte Kernkraftwerke **871**

Untersuchungen, die auf den verbesserten Betrieb von Kernkraftwerken abzielen, sollen von en britischen Elektrizitätsbehörden in neu errichteten Laboratorien im Westen England durchgeführt werden. Kraftstoffelemente aus Kernkraftwerken werden in dick gepanzerten Behältern in diese Laboratorien geschafft um in besonders abgeschützten Ortlichkeiten durch Fernsteuerung freigelegt und einer metallurgischen und chemischen Untersuchung unterworfen zu werden. Weitere Forschungsmassnahmen haben den Zweck, die Wärmeabgabe von Kraftstoffelementen sowie Veränderungen im Grafit, die auf radioaktive Strahlung zurückzuführen sind, zu untersuchen.

Eine Kabelverbindung zwischen dem England und Frankreich **877**

Ein papierisoliertes Kabel von 24 km Länge, das 100 kV an Erde gelegten Gleichstrom führen soll, wurde bereits auf ein Kabelverlegungsschiff verladen um demnächst im Armelkanal verlegt zu werden. Dieses Kabel soll in der Mitte des Kanals an ein in Frankreich hergestelltes und von einem französischen Schiff verlegtes Kabel angeschlossen werden.

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

"Canberra"—The First British A.C. Passenger Liner **861**
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"Canberra" Propulsion System **864**
by L. W. W. Graham

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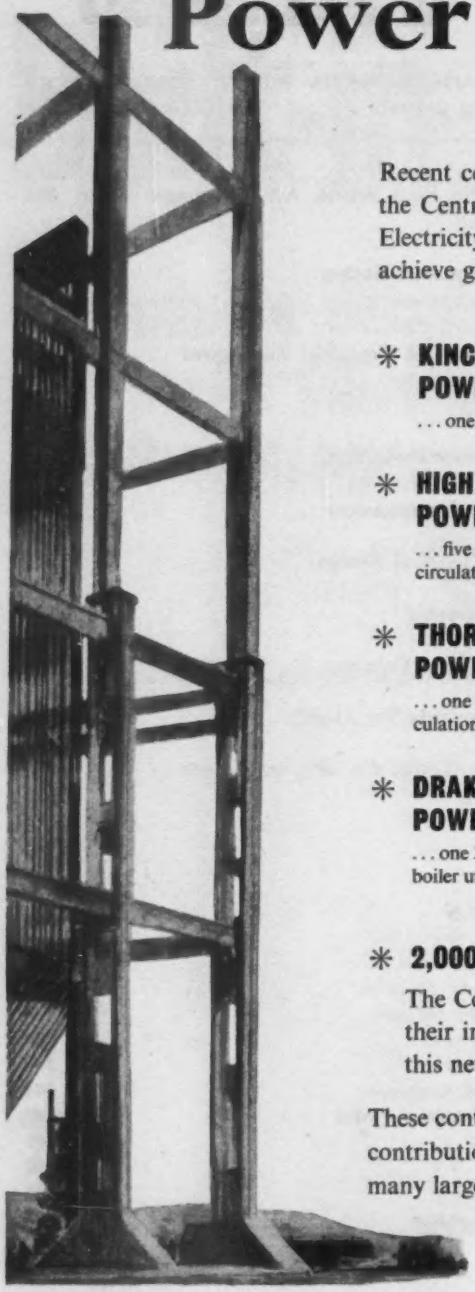
Progress in Power Plant Design



Recent contracts placed with International Combustion Limited, by the Central Electricity Generating Board and the South of Scotland Electricity Board, clearly show the pattern of development adopted to achieve greater output and reduce generating costs.

✳ **KINCARDINE POWER STATION**
... one 120MW boiler unit.

EVAPORATION *860,000 lb/hr*
STEAM PRESSURE *1,600 lb per sq. in*
STEAM TEMPERATURE *1,010° F*
RE-HEAT TEMPERATURE *1,050° F*

✳ **HIGH MARNHAM POWER STATION**
... five 220MW controlled circulation re-heat boiler units.

EVAPORATION *1,400,000 lb/hr*
STEAM PRESSURE *2,450 lb per sq. in*
STEAM TEMPERATURE *1,060° F*
RE-HEAT TEMPERATURE *1,050° F*

✳ **THORPE MARSH POWER STATION**
... one 550MW controlled circulation twin furnace boiler unit.

EVAPORATION *3,750,000 lb/hr*
STEAM PRESSURE *2,400 lb per sq. in*
STEAM TEMPERATURE *1,055° F*
RE-HEAT TEMPERATURE *1,055° F*

✳ **DRAKELOW 'C' POWER STATION**
... one 375MW super-critical boiler unit.

EVAPORATION *2,500,000 lb/hr*
STEAM PRESSURE *3,650 lb per sq. in*
STEAM TEMPERATURE *1,110° F*
RE-HEAT TEMPERATURE *1,055° F*

✳ **2,000MW FOR WEST BURTON POWER STATION**

The Central Electricity Generating Board has recently announced their intention to order the four 500MW re-heat boiler units for this new Power Station from International Combustion.

These contracts are significant stages in the International Combustion contribution to power supply in Great Britain, and are supported by many large overseas contracts and for Nuclear Power Plant.

IC

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INTERNATIONAL COMBUSTION LIMITED

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 1 JUNE, 1961

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T. W. WRIGHT

Comment

LESSONS ON THE GRID

Every disaster has its lessons and such is the case with the interruption of supplies in south east England on 15 May. The special committee of inquiry has reported with commendable promptitude and the broad sequence of events is evaluated. Technically, however, much remains to be done. How a disturbance can travel round the south east area and bring out a solitary breaker two-thirds of the way round, alone needs additional study. Perhaps more will be heard of such happenings when the final report is issued. In the meantime, a programme of work is set by the recommendations of the committee which no doubt will be adopted by the Board when they have considered them. First, to make things as safe as possible in the south east, even though it may mean some departure from the most economic operation, and then to study other parts of the grid network to see if similar conditions exist elsewhere. This is the least that can be done. On the technical side, there is tacit endorsement of automatic unloading in the event of a serious drop in frequency, a step which will have to be carefully weighed. At the time of the interruption three important interconnectors were out of service, yet no recommendation is made on greater attention to such disconnections; but it is urged that methods of accelerating maintenance should be studied. A review of the liaison between technical and operational staff is an obvious need which is pointed out. Whatever may have been the technical factors that led to the sequence tripping, the simple fact that a vital circuit-breaker in the system was allowed to open on overload due to a misunderstanding on the setting of the protective gear, emphasises the need for such a study. Doubly so since the committee affirm that there was no negligence on the part of the Board's staff.

BUYING NUCLEAR EFFICIENCY

The CEGB has spent £2 million on the nuclear research laboratories formally opened at Berkeley this week. They are investing as well the scarce manpower represented by 120 graduate scientists and engineers and an equally large supporting staff. This new addition to the Board's research and development organisation speaks clearly of their determination to be able to judge nuclear matters for themselves, rather than have to rely on information supplied by the UKAEA (as consultants) and the consortia. Although a considerable part of the effort of the laboratories will be devoted to keeping a check on the behaviour of nuclear power stations, fundamental investigations are intended as well. This brings risk of duplicating the efforts of other organisations. On the other hand, it introduces the advantage

of independent thinking, something welcome in the hitherto enclosed field of nuclear power fundamentals. The disadvantages of duplication are more than offset by the urgency which will be behind the CEGB work when several stations are operating. Better information on behaviour of materials and the processes involved in converting fission energy to electrical current should pay off in improved efficiencies and longer life for the power stations now being erected and economy in the stations still to come. It is noticeable that the Berkeley laboratories are essentially confined to work on the gas-cooled reactor, although not only the present natural uranium type. That is appropriate in view of the commitment of the CEGB to this design for many years ahead, but it limits the range of informed comment which the laboratories will be able to offer on radically different designs.

CHANNEL LINK

In the absence of unexpectedly bad weather, the British and French halves of the cross-Channel cable should be jointed this month. It is just about ten years since the then BEA and Electricité de France set up a joint committee to investigate the possibility of the link; five years since agreement was reached on a 160 MW cable operating at 100 kV to earth. Now the scheme is moving relatively rapidly towards fruition. It is hoped that trial operation will start in July, and that commercial operation will be possible in time for the peak load season beginning in December. The behaviour of the converting equipment at both ends of the line and the techniques of operation will have an importance far wider than that applying to this link. Although the distance is comparatively short, the magnitude of the power interchange makes this a major test for h.v. d.c. transmission, in the news so much since 1945, but relatively little represented as yet in terms of operating transmission circuits. The major New Zealand plan in particular will be dependent for details on the way the Channel scheme operates. So far as the link itself is concerned, its magnitude is comparatively small compared with the two systems tied together; and perhaps three or four times smaller than would be possible if the economics are right. The prime purpose of the link is exchange at times of daily peak, which are separated for the two countries by differences of standard time in winter, and of national habits. There are additional exchange possibilities in the preponderance of hydro power in the French system and of thermal power in the British.

CANBERRA TEST

Like any other major engineering venture, the liner *Canberra* has been so much written about during construction that it almost comes as a surprise to realise that the many novel ideas she incorporates have still to be put to the test of regular sea service. From the electrical viewpoint, two outstanding features of the ship are the size of her main turbo-electric propulsion system and its accommodation in the stern of the ship, with the use of an alternating current system for the electrical distribution and auxiliaries. Both these features receive extended treatment in our pages this week, the day before the ship sails on her maiden voyage. Both represent departures from established practice that are confidently expected to prove themselves in competition with the alternatives of mechanical transmission and d.c. distribution. The two *Canberra* main alternators are 32·2 MVA rating, supplying four motors to drive two propellers. For larger ships there are already plans for five-motor, five-propeller arrangements to make use of the flexibility of electrical control, with two cross-compound turbines supplying the power. It is the same story with the distribution and auxiliaries system. As we have reported before, the demands a large liner imposes are reaching the limit of what can conveniently be handled at 440 V. Large ships of the future are likely to need primary distribution at something like 3·3 kV to keep copper requirements and protective gear duties at reasonable levels. *Canberra* will provide important data for securing such extensions of present practice.

207 G

When the National Inspection Council began its survey of new wiring work in the UK, 4½ years ago, it concentrated its efforts on house wiring. House wiring is inevitably the Cinderella of electrical installation work so far as quality is concerned. Many were the faults found repeated time and time again; and of the offences against IEE requirements, the dubious distinction of being the most common was infringement of 207 G. This regulation requires that unprotected cable cores shall be terminated in enclosures of incombustible, damp-proof material. At lighting points in particular, the requirements were ignored and it is only after sustained effort that the NIC has been able to report, a few weeks ago, that significant progress has been made in securing respect for this requirement. Proper use is now being made of patresses, and the fixing of unbacked socket-outlets to soft wood skirting boards without further protection for cable cores stripped of their sheaths is less common. Currently, some progress is being made with the problem of cable terminations at the back of consumer service units, which can also offend against the regulation. Attention to details such as these, and constant reiteration of practical ways of meeting the requirements of the regulations, provides a positive part of the NIC inspectors' work, which is operating to raise the standard of house wiring; 207 G is a particular success story, even though plenty of contraventions of that regulation are still met with during inspections.

Meteor

This week's quick summary of electrical news faces advertisement page 14

THE FIRST BRITISH A.C. PASSENGER LINER

by D. M. Searle*

THE decision to adopt an a.c. electrical system on the P and O liner *Canberra* is in line with the general trend towards a.c. for all seagoing ships and is based on extended experience with a number of merchant vessels. In so far as British marine practice is concerned, the *Canberra* installation, though not departing greatly from established practice, is a major exercise since the electrical demand is, naturally, larger and more diverse than on a vessel designed mainly for cargo carrying. A brief description of the layout may, therefore, be of some interest.

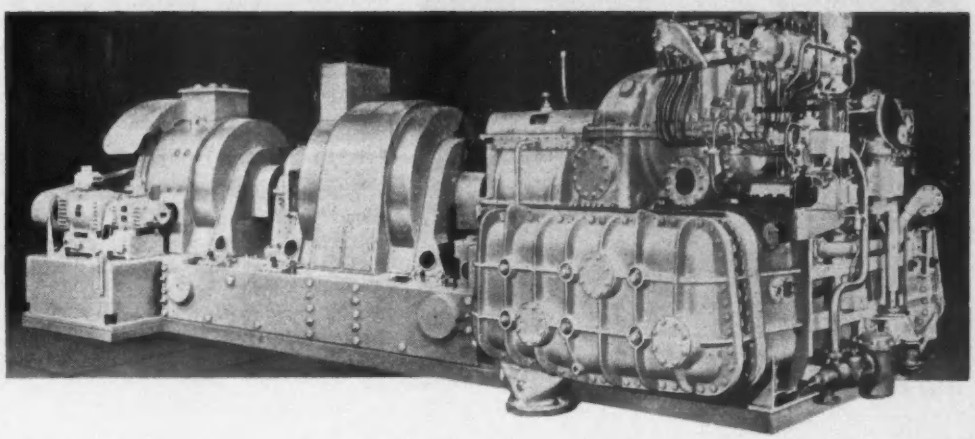
The Alternators

The whole of the electrical load, other than that for the propulsion motors, is derived from four 1,875 kVA AEI turbo-alternators, each generating at 440 V three-phase, 60 c/s, 0·8 power factor. Normally, the demand is satisfied by running three in parallel, the fourth acting as a standby. The alternators are connected to the main distribution busbars through 3,000 A, Type OB24 English Electric airbreak, solenoid-operated circuit-breakers, control and synchronising being effected from the three central panels of the main switchboard. The circuit-breakers, located in two cubicles either side of the synchronising and alternator control panels, are closed and tripped by handle-type switches on the control panels via contactors housed in the bottom of the switch cubicles. Emergency mechanical trip buttons are also provided on the front panels of the switch cubicles.

The alternators are star-wound with the star point insulated from earth. The system is, therefore, three-wire mesh fed from a star-wound alternator, distributing at 440 V between phases throughout the vessel. All 230 V single-phase supplies are derived from English Electric marine pattern air-cooled Class "B" transformers ranging from 20 kVA to 90 kVA of which four are stationed at each of the 13 master switchboards, one being a standby unit in each case. From these, power for lighting, single-phase motors, vacuum cleaners, small galley equipment, floor polishers and a host of other electrical equipment is derived. The 230 V system is unearthed, each single-phase section acting as a separate system electrically insulated from others, the between-line faults being limited by transformer reactance to values considerably lower than would be the case in an equivalent d.c. system.

Portable equipment, such as drilling machines, deck-scrubbers, paint spraying plant and other industrial appliances used in cleaning and maintenance is fed from separate power points at 110 V through 440/110 V trans-

* Electrical Supervisor, P and O/Orient Management Ltd.



One of the four 1,875 kVA, 440 V 3-phase, 60 c/s AEI auxiliary turbo-alternators on the "Canberra." On the extreme left is the main exciter for the 6 kV propulsion alternator and the vee-rope driven exciter for this machine (AEI (Rugby) Ltd.)

formers, single-phase, with the mid-point of the secondary winding earthed.

Earth faults on the primary side of the single-phase transformers are sensed on simple earth-fault detectors to the extreme right of the main switchboard, these being a group of three indicating lamps connected in star with the mid-point earthed and the outers across the phases. One detector is provided for each master-switchboard. A single earth fault on an unearthed system, of course, causes no trouble and can usually be identified, located and rectified before a second occurs.

Taking the auxiliary alternator reactance as 14½%, the fault level on the busbars would be of the order of 39 MVA with three machines in parallel. By introducing 7% fault limiting reactors in the phases between the Port and Starboard busbars, the symmetrical fault power is limited to 34½ MVA. These reactors are located behind the lower panels of the three centre cubicles.

Power Groups

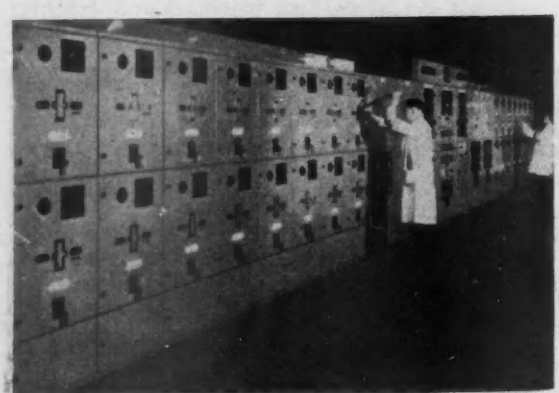
Apart from the ordinary electrical services supplied from the master board positions, a number of power groups are directly controlled from the main board through their own breakers. Many are duplicated as Port and Starboard supplies and some are, in addition, further subdivided into two groups, essential and non-essential supplies, controlled by upper and lower switches in the same panel. Typical of these are the main engine room Port and Starboard groups (panels 3, 11, 31, 39), boiler room groups (4, 12), pump room groups (8, 16) and the auxiliary alternator room supplies (30, 38).

Circuit-breaker ratings range from 900 A to 1,600 A and are operated from the front of the 32 switch panels on the Port and Starboard wings of the main switchboard. The switches are English Electric, type OB23, solenoid-operated, airbreak, also controlled by handle-type control switches via contactors at the base of the cubicles with mechanical trip by push-button as an emergency feature. The removal of an access cover in the face of each panel enables a lever to be inserted for hand operation, a facility normally used only for maintenance and adjustment when the board is dead. Castell type interlocks prevent the panel fronts from being opened and the switch withdrawn from the busbar isolating contacts unless the current is off. An ammeter and phase selector switch are also provided for each circuit.

Bow Propeller Circuit

To the extreme left of the port wing of the board, a 6 ft wide cubicle houses the 440 V/3·3 kV three-phase transformer supplying the stator of the bow propeller motor. The adjacent top cubicle contains the 1,200 A switch controlling this transformer and is switched on, at the request from the bridge, when the bow propeller is required for docking manoeuvres. Direction and speed of the propeller are controlled from three push-button stations on the bridge. Each station has five buttons giving full and half speed to Port and Starboard and stop, the control being applied to the rotor, through a special Allen-West control panel. The rotor resistance is in four steps per phase, two steps being cut out by each push-button with a timing relay to control the interval between steps and, thereby, the rate of acceleration. Reversal is effected through a gear box with hydraulically operated clutches controlled from contactors on the control panel. At reduced speed the rotor resistance dissipates about 135 kW.

There are two spare positions on the board and on the starboard wing is the usual provision for degaussing gear.



The main English Electric distribution and alternator control switchboard in course of installation. The total length is 71 ft 6 in.

Alternator Protection

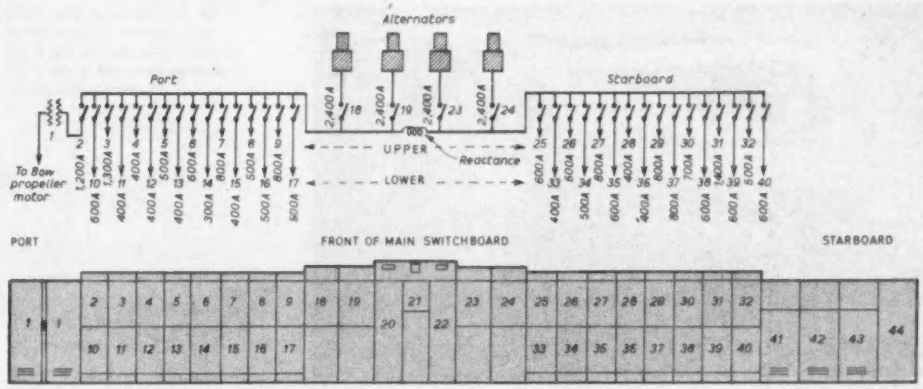
The trip circuit of each alternator switch is operated by (a) the control switch; (b) the generator overspeed switch; (c) loss of vacuum on the turbine condensers; (d) a reverse power relay; (e) two overcurrent relays; (f) an under-voltage relay; and (g) a field failure relay. Trips (b) and (c) are mechanically operated by the turbine overspeed governor and a switch in the vacuum line to the condensers respectively. The reverse power relay, English Electric type WDG, operates in the event of a feedback of power from the busbars to the alternator. The two overcurrent relays, type CGG, are inserted in the red and blue phases and are protected against transient operation by a type VAT timing relay, set to operate in 15 sec on a sustained overload exceeding 150% full load. The undervoltage relay, type VDG, is also protected against transient "dips" by a type VAT timing relay, set to 2 sec. The field failure relay is again another type CGG. These seven relays, together with a further overcurrent relay in the yellow phase which is used in conjunction with the preference tripping circuit, are mounted on the front of each alternator switch cubicle.

Feeder Protection

Every outgoing feeder switch incorporates its own direct acting, magnetically-operated, oil-dashpot time-delay, series trip mechanism. In addition, overloads on the busbars can be reduced by shedding non-essential loads before the alternator overloads approach values which would operate their individual overcurrent relays. This preference tripping is effected by two type VAJ relays on the central panel, each controlling selected non-essential breaker trips, which are operated in sequence by a type VAT timing relay. The overcurrent relays referred to in the previous section on each alternator are set to 110% full load current for the machine and, if this is exceeded, it energises the timing relay which sheds the non-essential loads in sequence at periods of five sec, sounding an alarm at the same time.

Group Starter Boards

The group starter boards supplied from the power group switches provide the local control of motorised equipment in the particular areas. For the most part, motors are of the three-phase squirrel-cage type with direct-on-line starting. Exceptions are the fore and aft windlass and capstan equipment which incorporate Ward-Leonard control. The forward windlass and capstan is supplied from the feed to Master Switchboard "C" and



The auxiliary a.c. system on the "Canberra" is controlled from an English Electric switchboard. This diagram shows the main circuits and the circuit ratings

The key to the circuit numbers is given below

1	Bow propeller transformer	23	Starboard inner alternator
2	Bow propeller switch	24	Starboard outer alternator
3	Main engine room group, Port	25	Master Board "A"
4	Boiler room group	26	Master Board "F"
5	Fwd. windlass, Master Bd. "C"	27	Galley No. 2, Master Board "E"
6	Master Board "D"	28	Starboard steering gear
7	Emergency switchboard link	29	Refrigeration group 1
8	Pump room group	30	Auxiliary alternator group
9	Galley No. 1, Master Bd. "L"	31	Main engine room group St'bd.
10	Spare	32	Propulsion motor room group
11	Main engine room group, Port	33	Aft Windlass, Master Bd. "N"
12	Boiler room group	34	Master Board "G"
13	Port steering gear	35	Master Board "J"
14	Master Board "H"	36	Master Board "M"
15	Master Board "K"	37	Refrigeration group 2
16	Pump room group, St'bd.	38	Auxiliary alternator group
17	Master Board "B"	39	Main engine room group St'bd.
18	Port outer alternator	40	Spare
19	Port inner alternator	41	Degaussing MM
20	Port alternator controls	42	Degaussing MQ
21	Synchronising panel	43	Degaussing MF
22	Starboard alternator controls	44	Earth leakage panel

comprises a Clarke-Chapman four-headed electrically driven anchor cable and warping capstan driven by two 140 h.p. motors. The aft installation, fed from Master Switchboard feed "N," comprises four 80 h.p. warping capstans, one to Port, one to Starboard, one on the centre-line aft and one on the centre-line of the promenade deck. Two 36 h.p. three-ton cargo winches at No. 1 hatch also incorporate Ward-Leonard control.

The steering gear, supplied from duplicate services (panels 13, 28), is a new departure from conventional methods since no telemotor transmitter is required. It provides three methods of control: normal hand steering with standard follow-up mechanism, automatic steering controlled by gyro-compass and computer and a simple push-button control from the bridge.

Galley Loads

The electrical galley equipment is most extensive and is derived from duplicated services at Master Switchboard positions "E" and "L." The cooking ranges have a total electrical load of 350 kW at 440 V. Hot presses, grills, toasters and boiling plates account for another 400 kW and there is also the confectioner's shop with its modern electrical equipment and baking ovens of special design. The refrigerating and air conditioning system is also a duplicated electrical supply and comprises fans, pumps, compressors, etc., about 200 motors in all.

Emergency Supplies

Emergency a.c. is provided from an emergency switchboard fed from two diesel engine-driven alternators each rated at 200 kW, 440 V, three-phase, 60 c/s with static excitation and arranged for parallel operation. The switchboard, also of the dead-front pattern, is interconnected with the main switchboard, the period of changeover being bridged, for lighting and other essential services on emergency circuits, by a 700 Ah capacity nickel alkaline battery charged by a transformer-rectifier unit. Batteries, also trickle-charged by transformer-rectifier equipment, supply the intercommunication, alarm circuits, ventilation control and clock systems.

All other circuits are fed from the nearest Master Switchboard and include the usual facilities on a first-class passenger vessel and several innovations. Seventeen lifts, five of them high-speed passenger lifts, the "Vertiveyor" for distributing passengers' luggage between the dock level and the proper deck with pre-selective control, and the side transporters for loading cars and heavy luggage described in these pages last year,† an electrically operated laundry capable of dealing with 170,000 pieces of laundry per week and 12 launderettes for the use of passengers are among the equipment supplied from the ship's a.c. system.

The use of an a.c. system also facilitates the wide adoption of fluorescent lighting, both hot and cold cathode, without the intervention of motor-alternators. Essential d.c. supplies, on the other hand, are satisfied from transformer-rectifier units incorporating semiconductor rectifiers. The cabling, of which there is more than 460 miles (350 tons in weight) installed on the ship apart from the telecommunication and low voltage systems, is mainly butyl-insulated with silicone and mineral insulation in hot locations.

The experience gained in planning and installing the electrical system on the *Canberra* will be of untold value to the British shipbuilding industry and should go far to establish a.c. as the standard for all future liners.

† Electrical Times, 24 March, 1960, p. 461.

A view of the Peacock room, one of the many public rooms on the "Canberra." Lighting on the liner includes 7,500 ft of cold cathode, over 6,000 hot cathode fluorescent tubes and more than 10,000 tungsten filament lamps. There are, in addition, some 1,600 emergency lights

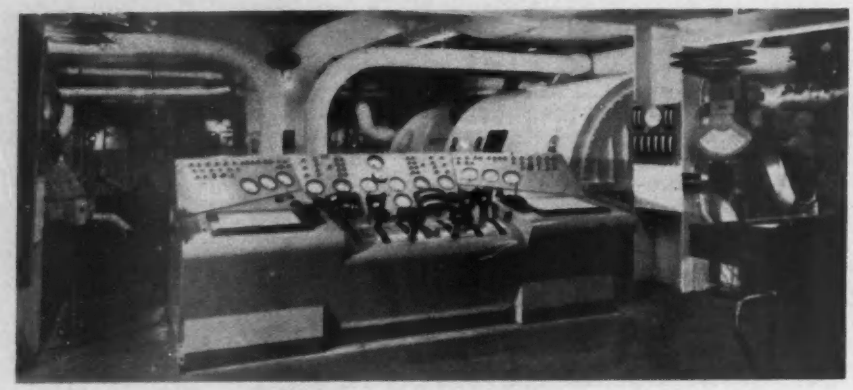


Fig. 1. The main propulsion motor control console in the engine room with, in the right background, one of the 6 kV AEI turbo-alternators

"CANBERRA" propulsion system

by L. W. W. Graham*

THOUGH by no means the first turbo-electrically propelled oceangoing vessel, the *Canberra* makes marine history on two counts; she has the largest and most powerful synchonous propulsion motors yet installed on any vessel and she is the first liner with turbo-electric equipment and boilers mounted as a closely integrated power unit in the after part of the vessel. A further point of technical interest is the manner in which the propulsion motors are split, a device adopted primarily because it enables the required output to be achieved in a unit of smaller diameter though greater length. This arrangement is more suited to an installation aft, but it also offers other advantages; should a fault occur in one half motor the other half can continue to be powered and, by driving one half of each motor from the same turbo-alternator, the propellers are held in synchronism.

Early turbo-electric marine installations of small size date back before the first world war. In 1920, two American aircraft carriers, the *Lexington* and *Saratoga*, were constructed each with four propellers driven by 45,000 s.h.p. induction motors coupled to turbo-alternators. By 1921, the induction motor had begun to give place to the synchronous motor with in-built squirrel-cage windings for starting and reversing. Lighter, smaller and more efficient than the equivalent induction motor, it enabled the designer to adopt a larger air-gap and, of course, it operated at unity power factor. The motors on the *Canberra*, for example, use an air-gap of nearly $\frac{1}{4}$ in. whereas the equivalent induction motor would have necessitated a maximum gap of $\frac{1}{8}$ in. and 0·8 power factor.

To the *San Benito*, a single screw, 2,500 s.h.p. 12$\frac{1}{2}$ knot fruit carrier of 3,686 tons launched in 1921, goes the honour of being the first British-built vessel to adopt the synchronous motor, the American-built *Cuba* preceding her by a few months. In 1931, two British passenger liners, the *Strathnaver* and *Strathaird*, came into service, each powered by two 10,700 kW turbo-alternators coupled to 14,000 s.h.p., 125 r.p.m. synchronous motors. After 30 years, both are still in service but are likely to be withdrawn in the not too distant future. It is the experience with these two vessels which has largely influenced the decision to adopt a similar system for the *Canberra*.

Perhaps the most famous turbo-electric vessel was the ill-fated French liner, *Normandie*, launched in 1934 and burned out in America while undergoing transformation to a troopcarrier during the war. Holder of the Atlantic blue riband in 1935 and 1937, this 80,000-ton vessel had four propellers turning at the comparatively high speed of 243 r.p.m. coupled to 40,000 s.h.p. synchronous motors supplied by 33,400 kW turbo-alternators. Though the total horsepower of the *Normandie* was greater than that of the smaller *Canberra*, the output of the synchronous motors in the latter is higher.

* Marine and Gear Sales, Heavy Plant Div., AEI.

The *Canberra* Installation

A plan of the general layout of alternators and propulsion motors in the *Canberra* is shown in Fig. 2. The engine room lies some 270 ft from the stern of the vessel with the boiler room above and about 100 ft further aft. This arrangement allows for shortest and simplest routing of the steam mains from the Foster Wheeler, Type ESD boilers, the largest to be fitted in a British ship to date. The three main units have an evaporative capacity of 260,000 lb/hr and the auxiliary boiler, 50,000 lb/hr. All four are designed to burn low grade fuel oil.

Steam is delivered to the turbines at 700 lb/sq in. 950°F, through stop valves, the flow being controlled by two governors, one set to hold the turbine shaft speed to 25% and the other adjustable between 85% and just above full speed when its acts as a pre-emergency governor to catch the set before it trips on overspeed. The emergency governor comes into operation on 10% overspeed.

The 43,800 b.h.p. AEI turbines are 17-stage, single-cylinder unidirectional machines and are coupled, through bellows couplings, to 32,200 kVA, 3,087 r.p.m., 6 kV, 3-phase alternators, the output of which is used exclusively for propulsion. The turbines are developed from land machines designed for power station duty where fuel economy and reliability are of paramount importance, the only fundamental difference being that they have been suited to variable speed operation. Each turbine includes the normal supervisory gear for such machines, including recording and indicating instruments for differential expansion between rotor and stator, eccentricity of rotor and detection of vibration in the bearing housings.

Alternators

The alternators are of the non-salient pole, two-pole cylindrical rotor type and are also similar in design to land based machines. One modification is the adoption of a higher short-circuit ratio—1·2 as against 0·5—so that the alternator is more able to cope with load swings at sea.

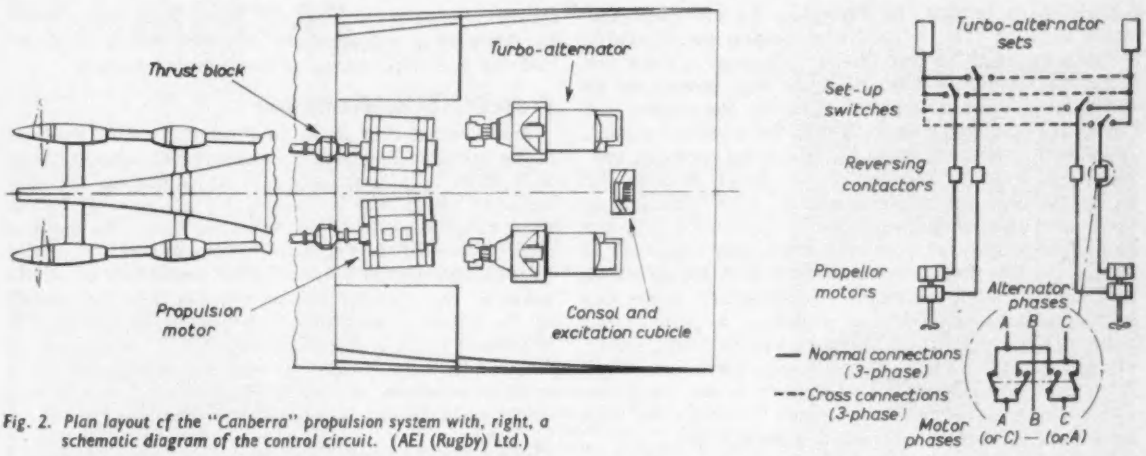


Fig. 2. Plan layout of the "Canberra" propulsion system with, right, a schematic diagram of the control circuit. (AEI (Rugby) Ltd.)

The air gap is 2½ in. between rotor and stator. Ventilating fans are fitted to the end flanges on the rotor winding retaining rings and sea-water circulated air-coolers in a chamber below the stator frame.

Excitation for propulsion alternators and motors is derived from any two of the four separate 300 kW, 300 V, 1,000 A, 1,200 r.p.m. exciters, tandem coupled to the four 1,500 kW, 440 V, 3-phase, 60 c/s auxiliary pass-out turbo-alternators which provide the main electrical services for the vessel. The exciter for the auxiliary alternator and the pilot exciter for the propulsion main exciter are vee-rope driven from the main exciter shaft (page 861).

There are four auxiliary turbo-alternators, three of which are on line together, but only two of the associated propulsion exciters are required to serve the propulsion alternators and motors. Two turbines, therefore, deliver power for both a.c. auxiliaries and for propulsion excitation, the third for a.c. auxiliaries only.

This arrangement introduces an interesting departure from conventional operational practice. While at sea, the three alternators should share the a.c. load equally. When the propulsion alternators and motors are excited, however, the alternator associated with the unloaded propulsion exciter takes a larger share of the a.c. load because the three turbines will equally share the total load. To ensure equal a.c. load-sharing at sea, therefore, the loading of the two alternators associated with the two propulsion exciters which will be in use is increased appropriately while that of the alternator not associated with propulsion excitation is reduced just prior to synchronising.

Propulsion Units

Each propulsion unit comprises two identical 42-pole synchronous motors sharing a common frame. The rotor is a fabricated drum carrying two spiders, to which are bolted the rotor poles, the drum being supported between forged steel stub shafts. Each rotor pole incorporates a strip-on-edge wound field coil and, embedded in the face, nine squirrel-cage bars. During starting, when the motor runs as an induction motor, the field windings are connected across a resistance in the air-trunking. Each propulsion motor is rated 42,500 s.h.p. at 147 r.p.m.

The induction motor pull-out torque is 67% full load torque during the starting period. With the motor synchronised at 25% full speed, the synchronous pull-out torque is 130% and at full speed it is 200%.

Control Circuit

The propulsion system has been designed to provide the full output with each turbine supplying its own propulsion motor to give a total output of 85,000 s.h.p. maximum. The normal service speed of 27½ knots in an average sea is achieved, however, at 68,000 s.h.p. output. For economical cruising, all four half-motors can be paralleled to take supply from a single turbo-alternator in which condition the total s.h.p. is limited to 40,000 with the alternator at 2,400 r.p.m. (40 c/s) and excited to 4,670 V. It was cruising speed which determined the alternator size.

The appropriate circuits are achieved by four groups of set-up switches, in cubicles outboard of, and below, the control console, one group being associated with each half motor-stator. The switches, which are manually operated and so interlocked that they cannot be operated unless the direction and starting levers are in the "off" position, have three positions: "Starboard Alternator," "Off" and "Port Alternator."

The normal running conditions obtainable with these switches are; (a) Port and Starboard alternators connected to Port and Starboard motors, respectively, propellers free, and (b) Port alternator supplying the forward half-motors and the Starboard alternator the aft half-motors of both units, propellers synchronised. This pattern of main

Fig. 3. General view of telephone and alarm panel in the bridge wheelhouse. The panel includes fire and sprinkler alarms, stabiliser and watertight door controls, liferaft release, navigation lights and degaussing indicators, etc. (Clifford & Snell)

connections is repeated in connecting the alternator and motor fields to their respective propulsion exciters (with a choice of four) so that the two electrical systems are completely independent at all times. For powers up to 40,000 s.h.p. either alternator, served by one exciter, can supply the four half-motors, served by a second exciter.

Below the set-up switch cubicles are the reversing contactors in their cubicles which, in circuit between the set-up switches and motors, control their direction of rotation. These contactors, rated a 1,550 A, 6 kV, are mechanically operated from the control console and are so interlocked that they cannot be opened or closed unless the excitation of both alternator and propeller motor has been switched off. There is, however, a period after breaking the excitation circuits when current is still flowing through the contactors and a voltage suppression circuit is incorporated to reduce this interval to the minimum. The engineer-in-charge does not open the contactors until his meters tell him that the main current is zero.

Control Console

The main levers on the control console overlooking the engine room are three in number for each set. The outer levers are the "Ahead" and "Astern" controls and are mechanically coupled to the reversing contactors. The next is the starting lever and is concerned only with applying alternator and motor excitations. In the first position, boost excitation is applied only to the alternator to run the motor up, as an induction motor, with the turbine governor holding speed at 25%. On the next step reduced boost excitation is applied to the alternator and motor fields for synchronisation, this being the most onerous load on the propulsion exciters at full power. In the third step, excitation for both motors and alternators is reduced to normal for continuous running, the total excitation load being about 300 kW from each exciter at full power.

The third, or "speed," lever is mechanically coupled to the turbine control gear. An adjustable worm on the lever engages with a rack to regulate the steam flow above the quarter speed position. The worm can be disengaged from the rack, to allow rapid lever operation, when bringing it back to the quarter-speed position or when taking it down to or up from "dead slow." Speed control is from quarter speed after synchronising, upwards to full speed or downwards to dead slow, the position of the speed lever and the setting of the high-speed governor determining when either the high-speed or low-speed governor is operative.

In a cubicle below the console are the magnestat voltage regulators, low-voltage control gear and excitation switchgear. Two excitation control units are provided for each alternator, one in service and one standby. In the event of failure, changeover is automatic. Failure of the second transfers control to manual. The regulators control excitation on a volts-per-cycle basis with motors synchronised but give fixed values of boost during starting.

Propeller Synchronisation

Provision has been made for synchronising the positions of the propeller blades in a predetermined relationship to each other as a possible means of combating any hull vibration which may be caused, for example, by hydrodynamic interference of the respective flows. The required blade relationship is obtained while the motors are running as induction motors by altering the resistances across the fields of one motor to adjust its slip. The relationship of the blades is shown on an indicator on the console instrument panel which is coupled to a differential selsyn. The rudder angle is also indicated on an adjacent instrument to establish any contribution that its interference might make to the flows and hull vibration.

Drives for Larger Vessels

With the experience in designing the *Canberra* plant, pilot proposals have been drafted for larger liners of the four- and five-screw type. One such plan, envisaged for 108,000-ton liners requiring 300,000 s.h.p. applied to five 250 r.p.m. propellers, is depicted in Fig. 4. Developed from the *Canberra* layout, two 150,000 turbo-alternators could be used to power five propellers through split-unit motors. During manoeuvring, the individual alternators would drive the two Port and the two Starboard motors with the fifth, central, motor coming into operation when under way and powered one-half from each alternator. This provides a flexible and compact arrangement and, since the chosen propeller speeds are higher, the 60,000 s.h.p. motors would be smaller than the 40,000 s.h.p. motors of the *Canberra*.

Turbo-electric propulsion for large liners offers many advantages over the conventional, purely mechanical drive, particularly now that we have got used to an aft position for boilers and smokestacks. One aspect not already mentioned is that, since the turbines can be run without the propulsion shaft turning, they can be warmed through thoroughly before being called upon to move the vessel and will still be able to run in the event of a sudden emergency stoppage. It is this sort of demand on a mechanically coupled system which gives rise to fears for shaft distortion in the turbine, fears which are considerably diminished in a turbo-electric drive. Since they have been launched within a few months and are planned for operation over the same routes, it will be interesting to see how the *Canberra* and her slightly smaller sister ship, the *Oriana*, will compare in running costs and handling over the next few years.

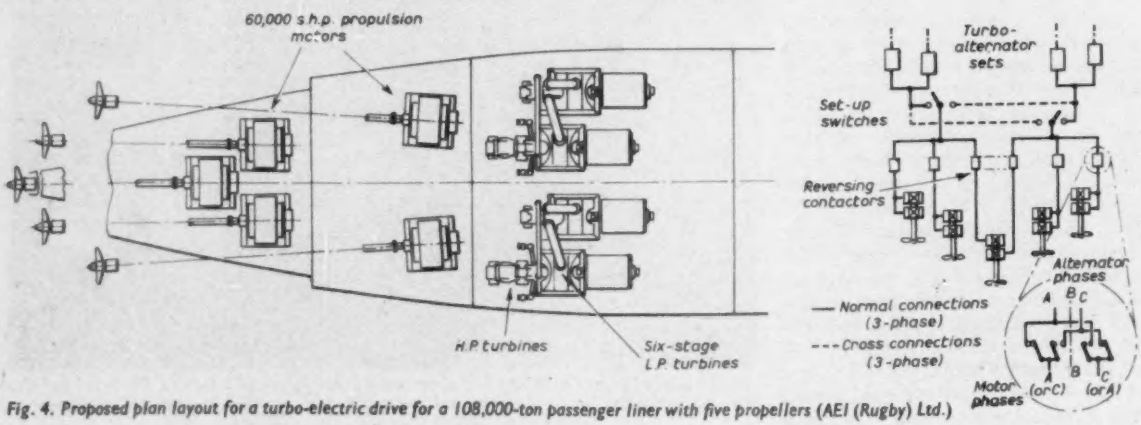
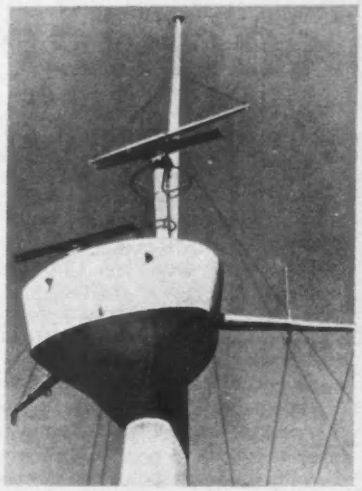


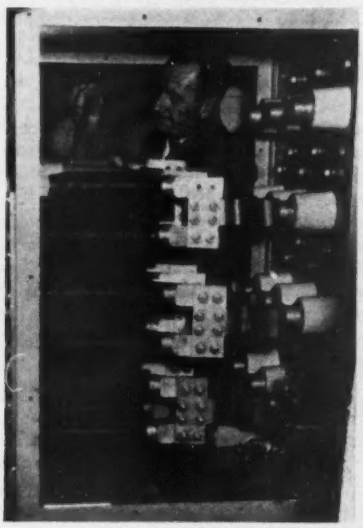
Fig. 4. Proposed plan layout for a turbo-electric drive for a 108,000-ton passenger liner with five propellers (AEI (Rugby) Ltd.)

"CANBERRA"

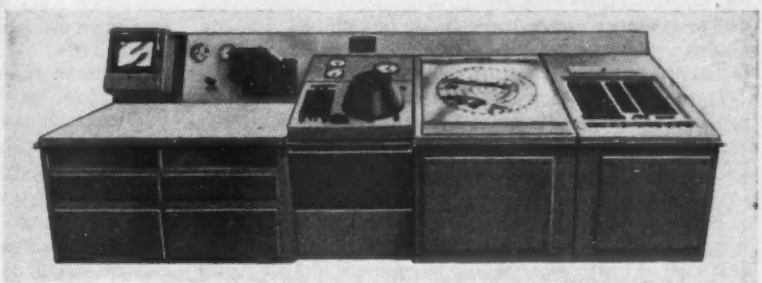
ITEMS OF ELECTRICAL EQUIPMENT

NEARLY 60 electrical manufacturers are listed as sub-contractors who have contributed major items on the *Canberra* and, of course, there are many more whose products are incorporated in equipment supplied by others. Space does not permit mention of all, but this page shows a few items, details of which have recently been released.

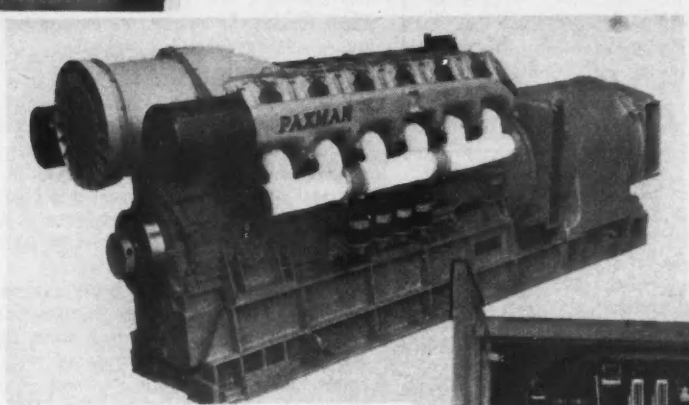




Left. The main 6 kV cables between the propulsion alternators and propeller motors were supplied by Johnson and Phillips. Two single-core cables per phase, each of 1·25 sq in. cross section, paper insulated, lead sheathed, cotton braided and finished with fire-resistant compound. Here a jointer is taping up the connections in the motor terminal chamber

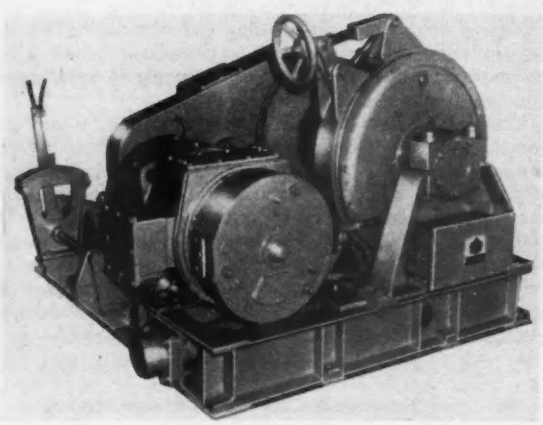


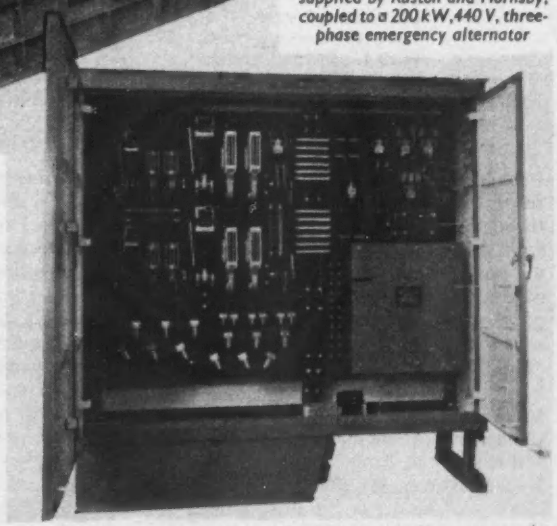
Above. Twin 10-ft scanners in the "crow's nest" on the foremast for the 16 in. and 24 in. Kelvin Hughes radar navigational console, shown beneath, which is installed in the wheelhouse



Left. One of two 12-cylinder Paxman "Vega" diesel engines, supplied by Ruston and Hornsby, coupled to a 200 kW, 440 V, three-phase emergency alternator

Below is one of the two automatic tension mooring winches on the "Canberra." These have a range of 2,500 lb to 15,000 lb pull in automatic control, corrected when tension varies by more than 500 lb. The 50 h.p. motor and control gear is by Laurence Scott and Electromotors





Above. The Allen West control panel for the bow propeller motor on the "Canberra." On the left can be seen the four rotor resistance contactors which are energised by the timing contactors on the right. Allen West also supplied more than 250 motor starters throughout the liner

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Neutral Current from Lighting

MR J. FLOOD, in his article "Neutral Current from Lighting," in the ELECTRICAL TIMES of 16 March, 1961, draws attention to the complications arising from third harmonic currents in circuits to which fluorescent lamps are connected. This condition has been noted in Australia where in the case of some large stores and office buildings, in which discharge lighting forms a major portion of the load, neutral currents of as high as 55% of the balanced phase currents have been observed in the mains and up to 80% in some of the branch mains. These conditions have been verified by laboratory tests.

Mr Flood's article, however, would seem to infer that these neutral third harmonic currents may be reduced by the installation of shunt capacitors at the fittings; i.e., by the normal type of power factor correction capacitors. The tests carried out in Australia do not support this conclusion; rather does it appear that the correction of power factor accentuates the third harmonic effect.

The following table shows the results of the laboratory tests, the lamps used being of the switch-start type:

Test No.	Test arrangement	Phase current—Amps			Neutral current	
		A	B	C	Amps	% of phase current
1	1-40 W lamp per phase, P.F. not corrected	0·406	0·388	0·404	0·096	24
2	1-40 W lamp per phase, P.F. corrected (2·6 μF.) ...	0·271	0·271	0·271	0·133	49
3	3-40 W lamps per phase, P.F. not corrected (P.F.=0·5)	1·2	1·2	1·15	0·33	28
4	3-40 W lamps per phase, corrected at individual lamps (P.F.=0·92)	0·63	0·73	0·7	0·33	48
5	3-40 W lamps per phase, P.F. corrected in bulk (P.F.=0·92)	0·6	0·75	0·63	0·39	59

An analysis of the wave form of the currents for the arrangement of Test No. 1 is as follows:

A PHASE	Composite wave	0·432 A
	Fundamental wave	0·430 A
	Third Harmonic Current	0·04 A
	Fifth Harmonic Current	0·01 A
	Seventh Harmonic Current	0·012 A
NEUTRAL	Composite wave	0·096 A
	Fundamental wave	0·003 A
	Third Harmonic Current	0·093 A

This examination of the problem would, therefore, seem to show that, with fluorescent lamps balanced across three phases of a 415/240 V supply, neutral currents of from 24% to 28% of the phase currents will flow when the power factor of the lamps is not corrected. Correction of the power factor of individual lamps by the insertion of shunt capacitors increases these neutral currents to something of the order of 48% of the phase currents. "Bulk" power factor correction of banks of fluorescent lamps results in a still further increase of neutral currents to as high as 59% of the phase currents; some 97% of the neutral current being third harmonic. There, therefore, seems to be no doubt that power factor correction of these fittings has a major effect on this phenomenon and a case could well be made for discouraging correction on these grounds.

It may be of interest to note that the Standards Association of Australia, following the lead of the IEC, has included in its Standard for Fluorescent Lamp Ballasts (A.S. No. C322, 1959) the requirement that the third harmonic produced by ballasts in association with fluorescent lamps, shall not exceed 25%.

H. S. Lloyd, B.E., A.M.I.E.E., A.M.I.E.(AUS.),
CHIEF INSTALLATION INSPECTOR,
THE SYDNEY COUNTY COUNCIL,
SYDNEY, N.S.W., AUSTRALIA.

Windsor Street Lighting

FURTHER to your article on the Windsor Street lighting project which was recently opened by HM the Queen and which was published in the ELECTRICAL TIMES, 18 May, I feel that two rather important points have been omitted.

Various firms and contractors have been mentioned in connection with this scheme, but no mention is made of the fact that the Windsor Council Electric Department did quite an amount of work with their own electricians. In addition, the type of cables used on this scheme were Pyrotenax m.i.c.c. cables. The Windsor scheme was a classic example of the use of Pyrotenax, where it was found possible to remove the cement from the existing brickwork and lay in the cable and then plaster over.

J. D. Parker,
MYTCHETT, NEAR ALDERSHOT,
HANTS.

Mail Order Trading

PEREGRIN is undoubtedly right when he says in his article of 27 April that more and more of the public are "trying to horn in on his retail trade without the expense of keeping a shop or paying tax."

The Association is well aware of the problem. Representations are continually being made to the manufacturers, but the difficulty is that mail order goods are not usually sold below list prices, although, of course, the commission to agents constitutes, in effect, a discount on such purchases they themselves make.

Where the list price is being maintained, the manufacturer has no redress under the Restrictive Trade Practices Act. He cannot take action, because the goods are sold at the correct price in accordance with his conditions of resale. Many manufacturers have, of course, on representation by the Association, refused to supply mail order houses direct. It has to be remembered, however, that there are many concerns, both retailing and wholesaling, which remain outside their appropriate organisation, and it is my experience that if one source of supply is sealed then another is soon found.

The only answer to this problem, I think, would be for the manufacturer to offer his guarantee only where his equipment was purchased through a recognised retailer. If the retailer completed a guarantee form on behalf of the customer and returned it to the manufacturer it would follow that any article sold outside normal trade channels would not receive the benefit of the guarantee. In this way, perhaps, the public might be educated to realise that, if they require good service, it is better to purchase their electrical equipment through normal trade channels.

L. C. Penwill, C.B.E., COMPANION I.E.E.,
DIRECTOR,
ELECTRICAL CONTRACTORS' ASSOCIATION.

BREAKDOWN STORY

South East England
9.26 p.m. 15 May

THE opening of a circuit-breaker at Wimbledon substation was the beginning of events which led to the shutdown of supplies in South East England on 15 May. This is the conclusion of the committee of inquiry set up under the chairmanship of Mr L. Rotherham to study the causes of the failure and to make recommendations. The pattern of sequence tripping has been determined, but further detailed study will be necessary before a final report can be issued.

The accompanying circuit diagram shows the connections and loads at 9.15 p.m., some ten minutes before the incident occurred. The load was rising because of the cold night. The area was importing energy and it will be seen from the diagram that only three points of supply were available to the area affected. In addition there was a considerable amount of local generation, but Northfleet was shut down for maintenance and at 9.15 p.m. the affected area had a deficit of 248 MW. The whole Thames South control area had a total load of 2,726 MW at 9.15 p.m., a deficit of 722 MW.

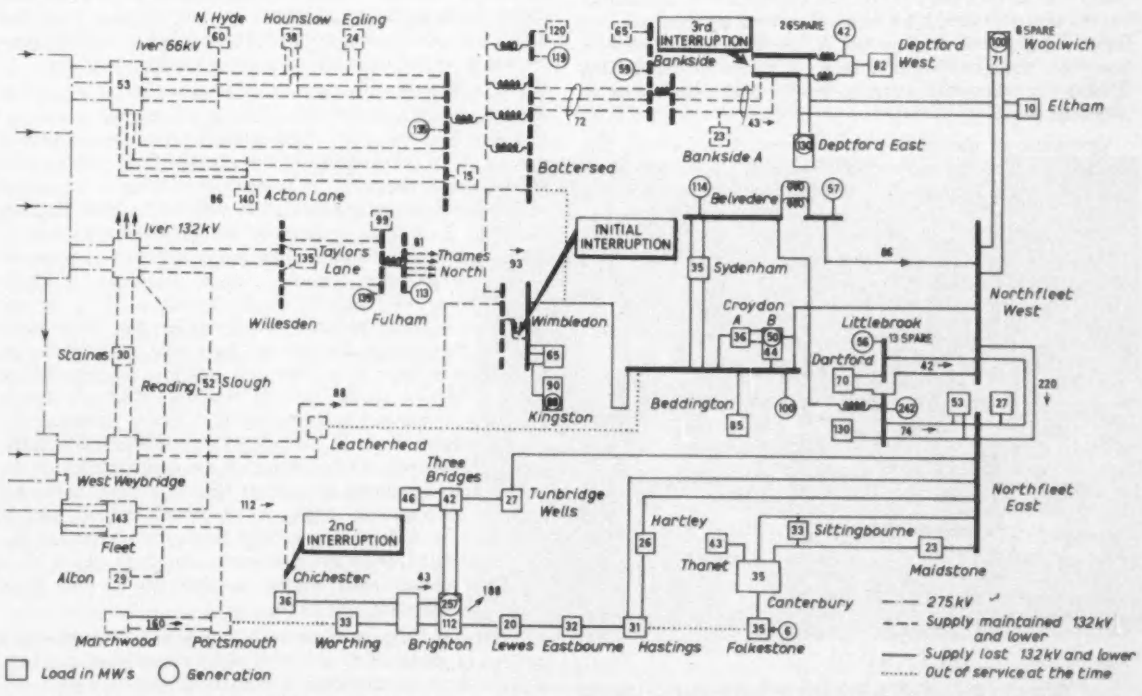
Overload at Wimbledon

The interruption at Wimbledon was caused by the circuit-breaker protecting a reactor opening on overload. It appears that some misunderstanding between divisional staff and Thames South system control had arisen on the trip setting of the protective gear. Changes had been made at Wimbledon which led system control to believe that the trip setting had been raised to a higher value whereas, in fact, no change had been made. Just prior to the incident the load in the area increased at an unexpected rate and is believed to have risen to about 120 MW from the 93 MW at 9.15 p.m. on the Wimbledon line. First supplies to consumers were restored within 32 minutes of failure, and complete restoration of bulk supply took place in 2 hours 55 minutes. No damage to plant was experienced.

The sequence of events following the c.b. opening at Wimbledon was surprising, one not easy to reconstruct. It is believed that the loss of this supply point set up a disturbance or surge on the system which resulted first in the interruption at Chichester of the incoming supply from the 275/132 kV substation at Fleet, a remote point for the surge to reach. Almost immediately afterwards the double circuit supply from Deptford West was lost, resulting in complete isolation of the South East area. The power stations operating within the area were unable to meet the demand and the generators were tripped either automatically or manually. Some effort appears to have been made to disconnect unessential supplies to achieve stability, but the fall in speed of generators was initially too great to allow subsequent recovery.

Recommended Action

The obvious comment that this shut down would never have happened if the 275 kV Canterbury line had not been delayed has already been made. Indeed, Sir Christopher Hinton, at a Press conference, went so far as to say that the south east will be regarded as a weak area until the 275 kV grid is extended through to Exeter. None the less, the interruption occurred when no less than three important lines were out for maintenance. Obviously, there are some important lessons to be learned from the interruption, and the committee of inquiry make six recommendations. The most urgent of these is a study



Thames South control area 9.15 p.m., 15 May, showing loads and circuits. Total load of area 2,726 MW. Total generated 2,004 MW

of means to assist the Thames South control staff to operate at a higher level of security until the 275 kV system becomes available.

Two study groups are recommended, one to examine the whole network with a view to locating points where similar conditions may arise and the other to investigate better methods of indicating to control engineers potentially dangerous conditions on the system. It is also felt that further consideration should be given to the automatic disconnection of load in the event of a serious drop in system frequency. On the operating side, it is considered that methods of accelerating maintenance on transmission equipment should be studied as well as the liaison between technical and operational staffs on the maximum rating of protective equipment.

On the question of the performance of the staff on 15 May, the committee states that under the stress of the emergency conditions it is clear that some errors of judgment occurred. It is equally clear, from the evidence, that there was no negligence on the part of the staff.

Rapid transformer protection

A HIGH-SPEED discriminative protection scheme for transformers, now available from GEC, is intended to give rapid indication of an internal fault. The scheme remains stable on through faults and is insensitive to magnetising inrush current. Insensitivity to inrush current is ensured by a tuned circuit which utilises the pronounced second harmonic component of the inrush current to bias the relay.

Sensitivity of the protective scheme is said to be 15% of the current transformer rating for all faults, except a three-phase fault when it is 10%. The speed of operation is 0·1 sec for a fault giving a relay current of three times the pick-up level, but only 0·05 sec when the relay current rises to ten times the pick-up level. The relay is stable for through faults up to 20 times the full load current and the percentage bias permits its use for a transformer with a tap-changing range of +15% to −20%.

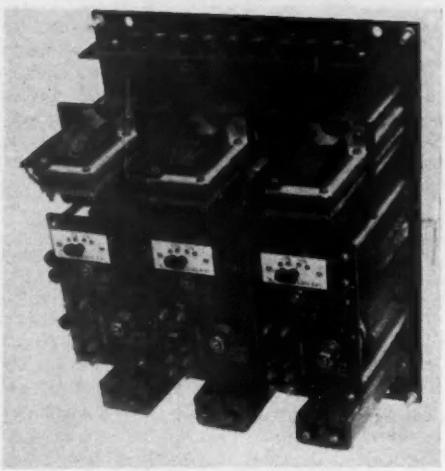


Fig. 2. View of a three-phase version of the high-speed inrush-proof relay with cover removed

Relay Operation

The circuit diagram for a single-phase version of the relay is shown in Fig. 1. For a three-phase scheme each phase has its own percentage bias transformers, differential circuit transformers, filter circuits and set of rectifiers, but only a single relay is required. In the three-phase version, the phase rectifiers are connected in series so that at any instant, the maximum current will be that obtained from any one phase.

Operation of the single-phase scheme is as follows. The percentage bias transformer will have an output proportional to the through load or through fault current and will effectively bias the relay to ensure that it is not operated under through fault conditions by any current from the differential circuit transformer which may result from mismatching of the line c.t's or the tap changer position.

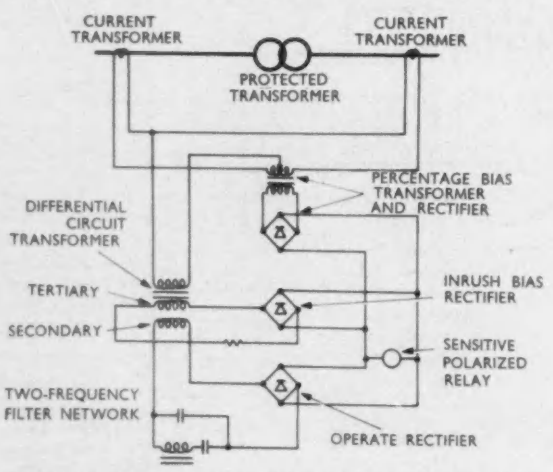


Fig. 1. Schematic diagram of the GEC type ZTB high-speed transformer differential protection relay. The relay is shown in the single-phase version

The differential circuit transformer has a secondary winding which provides the actuating current for the relay, and a tertiary winding which provides the bias to prevent operation by magnetising inrush current. The tertiary has a small series resistor. The secondary winding is connected to a tuned-circuit consisting of two condensers and an inductor. This filter presents a low impedance to 50 c/s input, but rejects the second harmonic 100 c/s component. Since transformer inrush current contains a high second harmonic content, in the region of 17% of the fundamental and sometimes much higher, the filter circuit ensures that, while the second harmonic current in the secondary is kept to a very low value, a corresponding current flowing in the tertiary winding effectively biases the relay to prevent it operating. By suitably choosing the circuit parameters it is possible to arrange that, at fundamental frequency current input, the output current of the c.t's flows to operate the relay; with a second harmonic current flowing, the relay is effectively biased against operation, and if there is a third harmonic content in the current flowing, the current in both secondary and tertiary windings cancel one another so that no current flows effectively through the relay.

The relay, designated type ZTB, is available in standard projecting patterns or in "Swingtest" withdrawable cases. Hand-reset flag indication is fitted and also two normally open heavy duty contacts for trip and alarm operation.

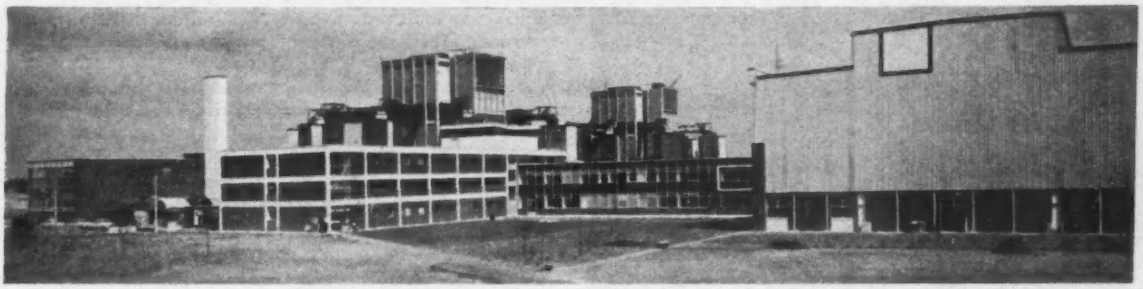


Fig. 1. Berkeley nuclear station is background to the nuclear laboratories

Seeking nuclear improvement

IMPROVING OPERATION AND DESIGN IS TASK OF C.E.G.B. LABORATORIES

BERKELEY Nuclear Laboratories are a branch of the CEGB's Research and Development Department. Their immediate purpose is to improve the performance of the Board's nuclear power stations once they begin operation. Since the science and technology of nuclear power is relatively new, it is certain that there are substantial technical advances to be made and economic gains to be realised. The £2 million Laboratories near the Berkeley nuclear power station provide the highly specialised facilities necessary for pursuing that end.

The Laboratories were formally opened on Monday by Lord Fleck, and the opening has been followed by a technical conference held in nearby Berkeley Castle, where some of the investigations already carried out by the staff have been described and discussed before an audience of nuclear energy specialists from many countries.

The Laboratories have been sited at Berkeley because it combines proximity to a nuclear station with reasonable accessibility to other nuclear establishments and the possibility of good university links. The main laboratory buildings are in the form of a letter "E," with a heavily shielded area for radioactive work and a laboratory block to the north, linked by an administration and office block to an engineering section to the south. Total floor area available is about 100,000 sq ft.

At present, the staff of the Laboratories totals about 250, with the proportion of graduates and the equivalent as high as one-half. It is anticipated that expansion over the next year or so may bring the number working at Berkeley to about 500.

Organisation

Three divisions share the work of the Laboratories: materials, physics and engineering. One of the most important factors in improving the operation of nuclear stations is to obtain information on the behaviour of materials as they operate under hitherto unknown conditions of high nuclear flux and high temperature. The Materials Division of the Laboratories is concerned primarily with problems of radiation damage. The outcome of its work will be closer prediction of the way materials will behave in reactors, where they are exposed to intense radiation for some years, and the introduction of better materials.

Two main tasks will be tackled by the Physics Division. At Berkeley will come work to extend knowledge of the physics of reactor cores. The same end will be pursued away from the Laboratories, when nuclear power stations are commissioned. Staff from Berkeley will provide assistance during commissioning, and will also pursue a programme of improving instrumentation for nuclear measurements. Another duty of the Physics Division will be implementation of an extensive programme of measurements on graphite samples from all the Board's nuclear reactors. This has the purpose of establishing the integrity of reactor cores, so that maximum life, consistent with safety, can be obtained.

More diverse work is likely to come the way of the Engineering Division, but one subject which is certain to receive much attention is the mechanical performance of fuel elements under operating conditions. This will include heat transfer, for even small improvements in this respect

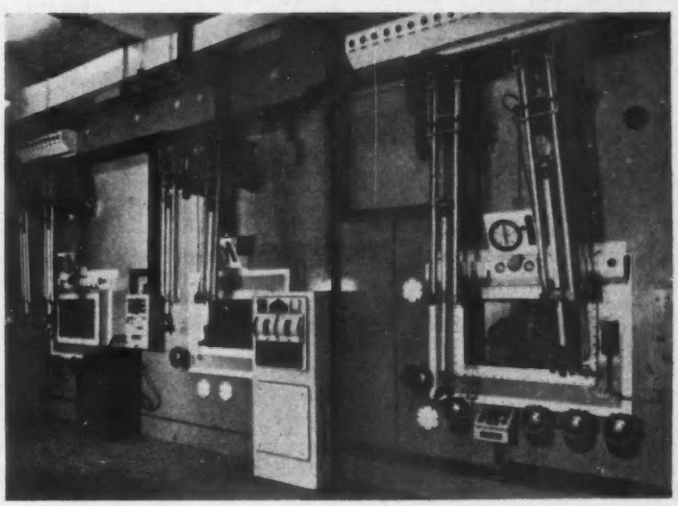


Fig. 2. Manipulators and periscopes at the front of the three heavily shielded "caves" where fuel elements from nuclear power stations will be inspected and cut up for further investigation

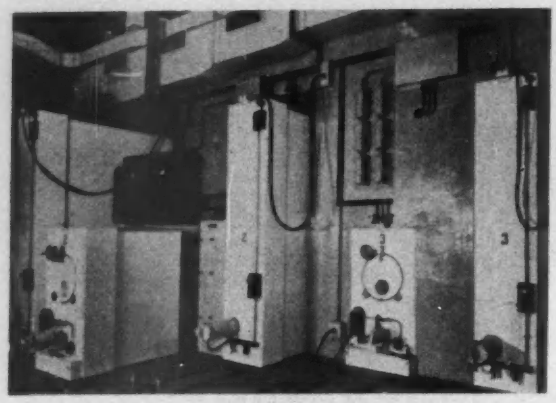


Fig. 3. Rear view of the caves, showing sliding concrete divisions

can pay big dividends in station efficiency. Mechanical aspects of fuel element handling, control systems and instrumentation will also receive detailed attention, and there will be work on the complex stress patterns of pressure circuit components.

Backing up the work of the Divisions and safeguarding the personnel will be a Health Physics Group.

Shielded Facilities

Most massive of the installations at the Laboratories is the shielded area, already mentioned; 180 ft long by 100 ft wide, this has been designed to make possible the examination of fuel elements and test specimens after they have been irradiated in power reactors. Layout and equipment are designed so that fuel elements can be received in transport "flasks" containing up to one million curies of radioactive material.

Fuel elements taken from nuclear reactors will reach the Laboratories sealed in stainless steel cannisters. Up to 30 of these are placed in 8 ft cubes, heavily shielded and weighing 50 tons apiece. (These are the flasks mentioned above.) The flasks are off-loaded by crane and deposited in a 20 ft square 29 ft deep storage pond at Berkeley. When a fuel element is required for examination it is removed from the flask under water and taken by a conveyor through a shielded tunnel into the first of a suite of three "caves" built and equipped by H. H. Hobson Ltd.

The caves are heavily shielded rooms, formed of ½ in. mild steel with concrete walls over 5 ft thick beyond. Each is 9 ft square and 14 ft high. Power-driven sliding partitions 2 ft 3 in. thick separate the caves one from the other. It is possible to see into the caves from the front through windows formed of lead glass filled with a zinc bromide solution to cut down radiation. Two of the caves are provided with periscopes as well.

All operations within the caves are carried out by remote control. Each cave has its own manually operated, remotely controlled manipulator. An additional power-driven manipulator (GEC) runs over all three caves and can be used in any one.

Normally, the fuel element is removed from the outer can, in which it has been placed for transport, in the first cave and inspected visually. It is then transferred into the second cave, where metrology and radiographic examination is carried out. In the third cave, leak detection equipment is available for detecting minute cracks in the main can. The element is then returned to the first cave, where two cutting machines remove the alloy main can. The uranium bar can then be sectioned, and small pieces returned to the third cave for preparation, using a milling machine, for mechanical tests and metallographic examination.

There are nine more lightly shielded cells running at right angles to the main caves. Specimens are taken to these by a shielded "railway." The 10 in. thick steel roofs of the cells are pierced to take manipulators. Two of the 5 ft by 4½ ft by 6 ft high cells are used for machining test specimens, a third for tensile testing and a fourth for metrology. Other cells have facilities for heat treating specimens and for sealing them in silica. A double-width cell is to be used for monitoring steel specimens.

Besides the cells, there are a number of lead boxes for smaller-scale work.

Physics and Chemistry

Running at right angles to the shielded area is a three-storey laboratory block. Work here is mainly concerned with investigations into the fundamental properties of materials for use in reactors. Most of the accommodation is used by the Materials Division, but there are also some facilities for the Physics Division. Besides the usual chemistry and physics laboratories, there is specialist equipment such as electron microscopes, spectroscopes, X-ray diffraction sets and other metallurgical equipment. The analytical chemistry equipment is directed mainly to examining irradiated fuel to determine the degree of utilisation of fissile materials.

For the Physics Division, this part of the Laboratories provides a graphite laboratory. In each CEGB reactor there are several thousand graphite specimens which will be removed in accordance with a pre-scheduled programme to determine changes in weight due to oxidation, in physical dimensions due to Wigner growth and in stored energy. Backing this investigation will be fundamental research into the behaviour of graphite under irradiation.

Engineering Hall

Accommodation for large test rigs is provided in the 160 ft long, 115 ft wide and 60 ft high Engineering Hall at the south end of the Laboratories. This also houses the main workshops for the whole establishment. A gallery in this building houses the major part of the Physics Division. There are laboratories for radioactive counting, for reactor physics, health physics and nuclear instrumentation, together with supporting workshops.

On the main floor of the building are two rigs for investigating the heat transfer properties of fuel elements. In these, fuel element cans are fitted with electric heaters, and atmospheric air passed over them. Two more rigs are designed to use pressurised carbon dioxide for cooling. Three other rigs are concerned with the force needed to push end caps off fuel elements under varied temperature and pressure conditions. Thermal cycling effects on fuel elements can be studied in another set of apparatus.

More detailed work on the mechanical properties of fuel elements is carried out in supporting laboratories, while instrumentation for the investigations of the Engineering Division is carried out in another laboratory.

Services

For heating the Laboratories two 11 kV, 2 MW electrode boilers are installed operating off-peak. For summer hot water supplies, there is a 100 kW electrode boiler. Water is stored in three pressurised vessels. At present, the Laboratories impose a load of 7 MW, which may ultimately rise to about 14 MW. For safety reasons, ventillation is closely controlled with comprehensive air filtering.

NOTES ON WIRING

BY MEGOHM

I HAVE often mentioned hospitals in these columns and, once again, I return to this subject, mainly because of the recent Hospital Exhibition held at Olympia in London. I took the chance to spend a few hours there with an engineer friend who is actively engaged in hospital engineering. There were several stands displaying electrical goods, but it was a mechanical exhibit which first held our attention—because of its electrical attachments, I hastily add! On the stand was a large washing machine costing, I would say, roughly £4,000, and stuck up on the top was one of the worst examples of electrical engineering I have seen for a long time.

The machine had an electric motor for driving purposes, a push-button unit and a safety switch to prevent operation when the lid was rolled back. These three items were within a length of 3 ft, and I counted six elbows and one inspection tee piece in the build up of getting the cables to the three positions, the total length of conduit used must have been about 2 ft and I could move it freely. There was not a fixing on the conduit and it relied solely on the tapped entries to the components for its rigidity. Needless to say, both my friend and I were, to put it mildly, rather taken aback.

We questioned the representatives on the stand about this matter, explaining that the arrangement would never stand up to the rough and tough life of a washing machine in a hospital. We suggested that the wiring could have been done in m.i.c.c. cables, thus presenting a much neater and safer arrangement. We were informed that this "could be arranged" and we rather stunned our informant by suggesting that it should not be necessary to ask for a "good engineering job"; it should be part of the service.

Now, to many people, this may appear to be a trivial matter, but my friend certainly did not think so. To him, such a state of affairs meant arranging for the conduit to be replaced by m.i.c.c. cable, and this could lead to delays in getting the machine working and, of course, extra costs. The thing that worries me most is the fact that such a machine might be exhibited beyond these shores, and such apparent bad electrical engineering taken note of. The manufacturers of m.i.c.c. cables would, without doubt, be most willing to co-operate with the washing machine manufacturer to ensure safety—and prestige.

Bedside Unit

At the same Exhibition I saw a new bedside unit which should meet with approval, both from the engineer's and the patient's point of view. This is a portable unit, served from a wall unit by means of a multi-core flexible cord, which has a switch for the bedhead light, a call push, a volume control for the radio headphones (also attached to the portable unit) and a selector switch for the available radio programmes. The portable unit is made of nylon and will be available in a varied range of colours. It can be varied to suit any requirements, including a driver for stethophone in place of the headphones.

The wall unit has a 12-pin (or 8-pin) socket, terminal plug, a relay for switching the bedhead light, and a bracket to hang the headphones on. This unit, too, can be varied to suit requirements such as a 13 A or 15 A switchsocket, etc. The portable unit can be hung in place on the wall unit if necessary.

The use is obvious. A patient can have the portable unit on the pillow or in the hand and no stretching of the arm is necessary to adjust the services which make life less tedious whilst in hospital. The construction of the whole arrangement is excellent, although in the hands of a less experienced firm than this one it might well have lost its value. Here is the result of good design, good engineering and the experience of asking "those who know." (Such a difference from that washing machine!) There may be certain engineers who will not look on such an arrangement with favour, but I feel that we shall see much more of this useful and sensible product.

Lighting Fittings

Still at the Exhibition, I was delighted to come across a stand displaying the desk fittings which I saw in a contractor's drawing office recently. I had the opportunity really to test the two fittings I mentioned, together with others marketed by this firm. A telescopic fitting for use in the anaesthetic room particularly interested me. This could be fixed to the ceiling at about 14 ft and the fitting pulled out to examine anything at about 3 ft from the floor. This is particularly useful where the close examination of a patient's skin colour is vital. Another useful fitting, and a new product I believe, was a small box-type bedhead light with louvre. This could be swivelled into any position and cut much of the normal glare experienced where an ordinary bracket is employed.

These lights, as I previously explained, are made in Sweden and are only just becoming known in this country. I forecast a great future for them, for they are of superior quality and workmanship. Not cheap, as one may guess, but worth the money, although I regret to say that £ s d is the main dictator of fittings and installations these days.

Indicator Lamps

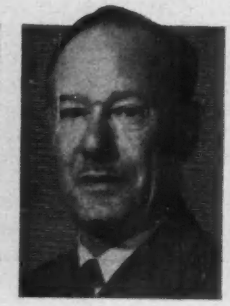
I have always been in favour of using indicator lamps at isolating positions for motors, etc., and immersion heaters. Quite often, when I recommend such an arrangement, I am questioned about the possibility of lamp failure. This, of course, must be faced up to, especially where it is not desirable to use the modern neon indicating lamp which has, as we know, a very long life. I was, therefore, rather interested in the new indicating lamp which has appeared on the market and which has a twin filament. The two filaments are embedded in a translucent cap with an opaque divider placed between them. This lamp, I am sure, will be welcomed, especially in the industrial field, and I shall be interested in its future.

I feel that indicator lamps should be more widely used in the domestic field. Often, I have assisted householders by installing switches with indicators for their immersion heater controls. This simple remedy for forgetting to switch the heater off when going out for a day has proved itself time and time again, and the extra cost is negligible.

Personalities *in the industry*

Mr A. W. Thomson

Mr J. S. A. Bunting



Mr W. J. Jones

Mr E. J. Counter

Mr A. Wilcock

Dr James Taylor, a director of Imperial Chemical Industries Ltd., has been appointed to the board of Pyrotenax Ltd. He succeeds **Mr M. J. S. Clapham** who has resigned from the board of Pyrotenax following his recent appointment to the main board of ICI. The latter concern holds an 18% interest in Pyrotenax Ltd.

Senior design engineer with British Insulated Callender's Cables Ltd. since 1960, **Mr A. W. Thomson,** A.M.I.E.E., has been appointed technical manager of BICC-Burndy Ltd. His duties will include the design, development and application engineering of all BICC-Burndy products. After attending Rutherford Technical College, Newcastle upon Tyne, and serving an apprenticeship with the Tyne Improvement Commission, he joined the South Eastern Electricity Board, and later served with the South of Scotland Electricity Board. He also held an appointment with the Air Ministry, serving in London and Aden, and joined the BICC Accessories Division in 1959.

Following reorganisation of Associated Electrical Industries' Cable Division, **Mr J. S. A. Bunting,** M.C., ASSOCIATE I.E.E., formerly joint divisional general manager, has been elected to the board of Associated Electrical Industries (Woolwich) Ltd. The AEI Cable Division is one of the four AEI Product Divisions in the Woolwich group. Mr Bunting, who was chairman of the Cable Makers' Association in 1958, and is president of the Batti-Wallahs, was general sales manager of W. T. Henley's Telegraph Works Co. from 1937 to 1946, when he became managing director of Edison Swan Cables Ltd. On the merger of that concern with Edison Swan Electric Co. in January, 1948, he became a director of the latter company and general manager of the cable interests. Mr Bunting was chairman of the integrating committee when Siemens Bros. and the Edison Swan Electric Co. were amalgamated, and was appointed commercial director, cables, of Siemens Edison Swan Ltd., a position he held until the beginning of 1960.

The following appointments have also been made in AEI Cable Division: divisional general manager and director of AEI Divisional Management Company, **Mr E. J. Vidler;** divisional commercial manager, **Mr F. V. Vaissiere,** B.COM., A.C.W.A., COMP.I.E.E.; divisional manufacturing manager, **Mr V. L. J. Plascott,** ASSOCIATE I.E.E.; and divisional chief engineer, **Mr W. G. Hawley,** A.M.C.T., M.I.E.E. The operation of AEI Cable Division is now organised into four product groups: Power Cables (sales manager—**Mr K. S. Estlin,** O.B.E., M.C., T.D., ASSOCIATE I.E.E.); Super Tension Cable (sales manager—**Mr R. G. Holland**); Rubber and Plastics Cables and Wires (sales manager—**Mr D. Beavan**); Distribution Equipment and Accessories (sales manager—**Mr H. Hubbard**).

Contracts manager of the Resistor Division of Fawcett, Preston and Co. Ltd., **Mr Cyril Smith** has been appointed sales manager of the Division.

Sir Patrick G. Hamilton has joined the board of Harper Engineering and Electronics. Sir Patrick is chairman of Expanded Metal Co. and of its subsidiary, Cressall Manufacturing Co. Ltd. He is also a director of several other companies.

In the Prestcold Division of the Pressed Steel Co. Ltd., **Mr N. C. Crowe** has been appointed general manager, Prestcold (East Anglia) Ltd. in succession to **Mr E. C. Baker** who has left the company. At the Kent branch, **Mr A. G. Roberts** has been promoted to branch manager, and **Mr R. W. E. Dimmick** becomes commercial sales manager. In addition, following the appointment of **Mr F. R. Best** as field sales manager, domestic, **Mr J. D. Andrews** is appointed Southern area manager, domestic.

A very well-known figure throughout the Lighting Industry for nearly 40 years, **Mr W. J. Jones,** M.I.E.E., F.I.E.S., director of the Electric Lamp Industry Council and of the British Lighting Council, is to retire from those positions on 30 June. His successor as director of ELIC will be **Mr E. J. Counter,** M.C., who has been deputy director and secretary since October, 1959, and the new director of the British Lighting Council is to be **Mr A. Wilcock,** A.M.I.E.E., DIP.M.I.E.S., who has been assistant director since November, 1959. Mr Jones became associated with the newly formed Lighting Service Bureau in 1924 after being in charge of Siemens Brothers' Lighting Department for five years. In 1928 he took over the post of manager of the Bureau, and did valuable pioneering work in establishing contact between the lighting industry and the optical profession, and in bringing architects into closer liaison with lighting engineers. The series of illumination handbooks containing design data was one of his early successes and he subsequently made other important contributions to data on lighting in various spheres. Mr Jones's association with the Lighting Service Bureau continued when, in 1941, he became director of the Electric Lamp Manufacturers' Association, its governing body. During the war he gave valuable service to Government Departments in such fields as lamp production and the formulation of factory and shop lighting regulations. More recently he has given evidence before a number of important government committees, and has presented numerous papers on lighting matters to various technical bodies. A member of the IEE Wiring Regulations Committee and chairman of its Code Drafting Committee on Lighting, he is also a past-president of the IES, a Freeman of the City of London and a Liveryman of

the Worshipful Company of Blacksmiths. All will join us in wishing this popular and breezy member of our industry a long and well-earned retirement. Mr Counter, who becomes director of ELIC, was educated at Maylan Preparatory and Dartford Grammar Schools and entered the services of a London bank before the war. During the war he served in the Royal Artillery and was demobilised with the rank of Major. After a short period with the War Office he joined the staff of the Electric Lamp Manufacturers' Association in 1946 and in 1954 he was appointed its commercial officer. He became Secretary of the Electric Lamp Industry Council on its formation in March, 1957, and was made deputy director and secretary in October, 1959. Mr Wilcock, who becomes director of the British Lighting Council, was the Council's regional engineer in the North West before coming to London. He had been with the ELMA Lighting Service Bureau since 1951, and was earlier with Benjamin Electric Ltd.

After 48 years in the electricity supply industry, **Mr Donald Duthie,** ASSOCIATE I.E.E., district engineer of Perth City, Kinross and Glencarse District of the North of Scotland Hydro-Electric Board, retired on 31 May. He started with Aberdeen Corporation Electricity Department, then joined the Calcutta Electric Supply Corporation Ltd. in 1923, serving there as mains engineer and latterly as district engineer until 1947. Service with the South Western Board as mains engineer at Ilfracombe followed, from 1947 to 1949, and finally with the North of Scotland Hydro-Electric Board from 1949.

From Nettle Accessories Ltd. we hear that **Mr A. E. Henbest,** London branch manager since 1958, has been promoted to Southern area manager, responsible for the whole of England south of a line from South Wales to the Wash, and **Mr A. Armitage,** formerly North Eastern Counties representative, has been promoted to Northern area manager. Mr Armitage will be responsible for the area north of a line from Birmingham to the Wash. Mr Henbest joined Nettle Accessories in 1954 as technical representative after five years with Vidor Ltd. and 20 years with Peto Scott Electrical Instruments Ltd. He became London depot manager in 1955 and was promoted to London branch manager in 1958. Mr Armitage joined Nettle in 1951 after representing Elexcel Ltd. in the Yorkshire area. The company also announce that **Mr F. B. Sharp** has been appointed sales office manager. Previously he was with Robt. McArd and Co. Ltd., and for 12 years with Edward G. Herbert Ltd.

Chief engineer at the John Lysaght Scunthorpe works since 1955, **Mr C. Challinor,** who joined the company in 1949 as electrical engineer, has been appointed to the board of directors. A native of Staffordshire, who joined the English Electric Co. in 1939, Mr Challinor was seconded to a Ministry of Fuel electrical consultants committee in 1945. He went to Scunthorpe to take charge of the electrical expansion scheme at the Normanby Park steelworks in 1949 and was appointed chief electrical engineer in 1955, succeeding the late Mr J. A. Peacock. He has been responsible for Lysaght's second largest post-war development scheme—the £13 million sinter and blast furnace project which includes the laying-down of a Linz-Donawitz steel plant.

Senior assistant engineer (meters) with the East Midlands Electricity Board, **Mr J. E. Bolus,** ASSOCIATE I.E.E., A.M.AMER.I.E.E., M.S.I.T., has retired after 46 years' service in the electrical industry. He gained early experience with Chamberlain and Hookham Ltd. and joined the Coventry Corporation electricity undertaking in 1920 as a meter and instrument tester.

The BBC announces the appointment of **Mr L. H. Griffiths,** M.A., B.SC., A.M.I.E.E., as head of the Film Unit, Television Studio Section, Planning and Installation Department. Mr Griffiths has been largely responsible for the design and planning of the central telerecording area at the BBC's new London Television Centre and was also responsible for the design and planning involved in the BBC's prototype mobile videotape recording unit which covered the Olympic Games in Rome last year. He joined the BBC in 1951.

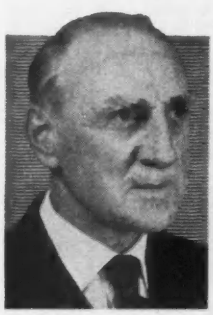
The Television Society has awarded the following Premiums for outstanding papers read before the London meetings in 1959-60: EMI Premium to **Dr R. Moller;** Electronic Engineering Premium to **Mr B. Eastwood,** B.SC., A.M.I.E.E. (AEI Ltd.); the Mervyn Premium to **Mr S. T. Palmer,** A.M.I.E.E. (GEC); *Wireless World* Premium to **Mr A. J. Garratt,** M.B.E., B.SC. (International Scientific Research Exhibitions); and the Mullard Premium to **Mr R. N. Jackson** (Mullard Research Laboratories).

Mr Iain Smith, B.SC., A.M.I.E.E., has been appointed a director of M and C Switchgear Ltd. He joined the company after four years' service in the Royal Navy. While graduating through the various departments of the company, he held successive appointments as chief of Engineering Department and later as technical manager.

The Cambridge Instrument Co. Ltd. have appointed **Mr K. J. Bush,** A.M.I.E.E., as assistant sales manager, Mechanical Thermometer Division, at Friern Pk. It is also announced that **Mr W. C. Orford, Mr S. V. J. Crump** and **Mr W. A. Hall** are assistant resident engineers at the company's branch offices in Nottingham, Bristol and Manchester, respectively.

A former part-time member of the London Electricity Board, **Mr Charles W. Dixon** has retired from the Council of the County Borough of East Ham, after 29 years' service. Mr Dixon, who is 75 years of age, was employed in the electrical industry for over 50 years—the last 27 with Standard Telephones and Cables Ltd., North Woolwich—and for 15 years was either chairman or vice-chairman of the East Ham Electricity Committee. He has also been a member of the IMEA Council and was for 15 years a member of No. 10 area, District Joint Board, Electricity Supply Industry.

Two new scientific attaché appointments are announced by the DSIR. **Dr**



Mr D. Duthie

Mr A. E. Henbest

Mr A. Armitage

Mr F. B. Sharp

Mr I. Smith

C. Manders, M.A., PH.D., is to be scientific attaché to the British Embassy in Tokyo to advise the British Ambassador on scientific matters and to report on Japanese scientific and technical development in the civil field. **Mr W. F. G. Drury,** A.M.I.E.E., is to be the new scientific attaché in Stockholm. He joins the DSIR from the RN Scientific Service, where he is currently scientific assistant to **Sir John Carroll,** deputy controller (research and development).

Mr C. R. Thompson has been appointed an executive director of Pye TVT Ltd. Since 1949 he has been their service manager.

Mr R. G. Woodwark, D.S.C., M.A., A.M.I.E.E., of the J. L. Eve Construction Co. Ltd., has been elected Master of the Worshipful Company of Turners for the ensuing year.

Prof Sir Bernard Lovell, O.B.E., F.R.S., director of the Nuffield Radio Astronomy Laboratories, Jodrell Bank, has accepted the appointment of scientific adviser to the British Space Development Co. Ltd.

Formerly with the AEI Woolwich Group, **Mr G. Gooderham** has joined Londex Ltd. as sales/liaison engineer for East Anglia.

Mr M. R. Parker has been appointed a director of Bakelite Ltd.

At present head of the Physics Department at the Royal Radar Establishment, Malvern, **Dr R. A. Smith,** M.A., PH.D., A.M.I.E.E., is to become professor of physics at Sheffield University from 1 Oct. next.

Previously district engineer at Hesledon to the North Eastern Electricity Board, **Mr J. Messenger** has been appointed organisation and methods officer for the Board at headquarters, and he has taken up his new duties (*ESH, pages 149, 152).

Mr A. R. Norman, an assistant marketing manager in the Refrigerator and Home Laundry Marketing Division at AEI-Hotpoint, has been promoted to marketing manager, portable appliances. He succeeds **Mr J. Kerridge** who has resigned to take up an appointment with J. Lyons and Co. Before joining Hotpoint in August, 1959, as a marketing assistant, Mr Norman was a junior account executive with G. S. Royds Ltd.

The BBC announce the appointment of **Mr S. W. Thompson,** A.M.I.E.E., as head of Technical Services Section in the department of the superintendent engineer, transmitters.

Mr W. L. Brown has been appointed sales office manager to W. Bryan Savage Ltd. and Pamphonic Reproducers Ltd.

* *Denotes revision to the "Electricity Supply Handbook, 1961."*

OBITUARY

Mr G. Bostock, formerly chairman of the Power Plant Co. Ltd., has died, aged 80.

Mr L. R. Morshead, M.I.E.E., who died on 24 May, aged 84, was for many years a consulting engineer, specialising in large-scale refrigeration installations.

Mr R. Longley, A.I.M.T.A., sub-area of the Yorkshire Electricity Board, died on 23 May, aged 47 (*ESH, page 144). He was appointed to Sheffield in May, 1959, but had served with the YEB at its headquarters since June, 1948.

Mr R. J. Glinn, B.SC., M.I.MECH.E., formerly with Babcock and Wilcox Ltd., who was actively associated in the development of pulverised-coal firing for steam generation purposes and was well known for his work on boiler feed-water chemistry, died on 22 May.

Dr T. Murray, a founder of the Consolidated Edison Co. and former member of the US Atomic Energy Commission, died on 26 May, aged 69.

Mr C. M. Kramer, B.A., LL.M., chairman and managing director of the Backer Electric Co. Ltd., died on 27 May, aged 43. He had returned only the previous day from a visit to Scandinavia.

Materials for Electrical Design

REFRIGERATOR FINISH FOR FUTURE

A NEW form of painted finish for refrigerators, which may become available in the near future, was reviewed by Mr R. A Fidler (Robert Ingham Clark and Co.) in a paper which was presented to the recent International Refrigeration Convention. He sees possibilities for increased use of strip coating or prepainted metal. In this technique, steel or aluminium in strip form is cleaned, pretreated, painted, stoved and recoiled at 60 ft/sec. Paint can be applied to one or both sides of the strip. In the USA, prepainted strip is available in sizes up to 48 in. width. Fabrication into simple shapes is possible.

Work has been carried out on bonding two sheets of metal to expanded polystyrene, so that interior and exterior surfaces plus insulating section are available in simple form. Again, dispersion coatings might be applied by roller in the continuous process and embossed after stoving, to give decorative finishes. There are a number of problems which have to be overcome before the continuous strip process can be used, particularly that of making suitable joints without ruining the paint film.

HIGH PURITY IRON

OFFERED as a high permeability, low remanence, low coercive force electrical iron, Super Permo is claimed to be 99·7% iron. Its particular application is to electro-magnet parts, field frames and the like. Its high purity introduces certain difficulties in machining, it should be noted. Flux density of 2 kG at 1 Oersted, 15 kG at 10 Oersted is claimed. *Samuel Osborn and Co. Ltd., Clyde Steel Wks, Sheffield.*

MIRROR-FINISH TAPE

EXCELLENT light reflecting properties are claimed for a new pressure sensitive "Sellotape" formed by coating polyester film with a heavy deposit of aluminium. Recommended as a surface medium or decorative trim, the tape is said to adhere to almost any flat or curved surface. The tape is available from ¼ in. to 2 in. width in 72-yd rolls. *Gordon and Gotch (Sellotape) Ltd., 8-10 Paul St, E.C.2.*

SMALL-BORE TUBES

COMPETITIVELY priced are three sizes of small-bore glass-fibre tubes, now available in normal lengths of up to 20 ft, made by a continuous process. The tubes are available with internal bores of ¼ in., ⅜ in. and ½ in. and with a wall thickness of $\frac{1}{16}$ in. *Fibre-glass Tubes (Isle of Man) Ltd., Kensington Hse, Rosemount, Douglas, Isle of Man.*

SOLDERING MAGNESIUM

INCREASING use is being made of magnesium components for electronic equipments in aircraft and missiles. To ensure freedom from electrical noise, bolted connections are not good enough and joints have to be soldered. Since magnesium cannot be readily soldered because of its surface oxide film, a method has been devised to apply a suitable copper or tinned copper coating. The magnesium component is first given an adherent film of zinc in a sodium zincate solution. A copper coating from 0·0002 in. to 0·0003 in. thick can then be added in an ordinary cyanide bath. A 0·0002 in. thick coating of tin is then applied by electro-plating followed by "flow melting," that is, dipping the plated part into a tinning oil which is sufficiently hot to melt the tin coating and cause it to flow evenly over, and bond with, the copper undercoat. Nickel can be used as an alternative to copper if required.

This process was developed by the US firm of Brooks and Perkins and was described in No. 51 of the Quarterly Journal of the Tin Institute.

SILICONES FOR ELECTRONICS

APPLICATIONS of silicones to the electronics industry are outlined in a 24-page booklet, "Silicones in Electronics," recently published. The booklet describes the properties of silicones and Silastomers and how they can be applied to various types of electronics components. *Midland Silicones Ltd., 68 Knightsbridge, S.W.1.*

Channel cable laying

OPERATION LIKELY THIS YEAR

EARLY December this year is the anticipated date for the cross-Channel electrical link between the French and British electricity systems to be brought into commercial operation. Last week an opportunity was given by the CEGB and the cable makers to inspect the cable-laying equipment, developed specially for the operation.

Laying of the British sections of the undersea cable was scheduled for last Saturday, but, owing to poor weather conditions, the operation was delayed until this week.

The cross-Channel cable will operate at a voltage of ±100 kV d.c. to earth and will be able to transmit 160 MW. Because peak hours on the British and French systems do not coincide, power flow in either direction at different periods of the day will assist both England and France to meet their peak demands and will result in an estimated saving in operational costs for both countries of about £340,000 each year. The cable will provide reinforcement for the supply in south eastern England through a 275 kV link to Canterbury and it will also compensate to some extent for the shortage of generating plant in the London area.

Cable Route

The twin British cables extend from Dungeness, three miles on a course magnetic east, and then 12 miles on a course 128° true to the Ridge, a submerged reef, where the joint to the French cables will be made at a depth of 15 fathoms. Each British cable is manufactured in a single length, one by AEI (Woolwich) and the other by BICC (Trafford Park). The French cables have been made by a consortium of four cable companies and each of their cables is in two underwater sections.

Because of the time delay likely in disengaging a suitable telegraph cable-laying ship from her normal duties and refitting her for laying the power cable, the CEGB decided to construct removable gear which could be fitted to their ocean-going collier, the *Dame Caroline Haslett*. Originally, the plan was to lay the British section of the cable and then for the French cable to be laid by the French cable ship *Ampere*, which would then have made joints between the two sections. However, the French decided to lay their section of the cable earlier and this operation was completed successfully on Tuesday, 23 May. Depending on weather conditions, the French cable ship will join the cables within two or three days of the British laying, during which time the cables will be given high voltage and other proving tests. After completion of cable-laying and testing, and installation of the terminal inverter equipment, the link will be operated for two or three months on a trial basis.

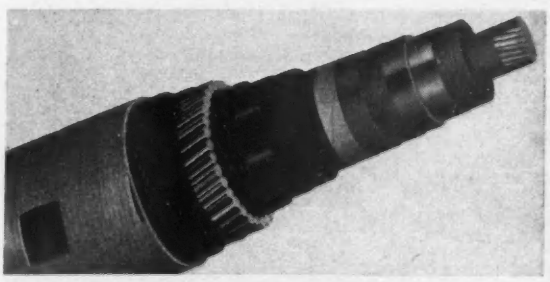


Fig. 2. Section of the d.c. 100 kV cross-Channel submarine cable. The cable has a 0·525 sq in. stranded conductor, solid impregnated paper insulation and weighs 39 lb/yard

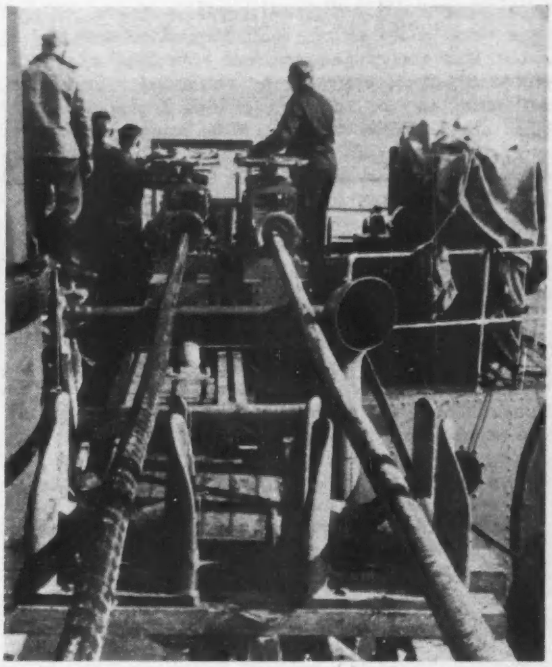


Fig. 1. Paying out the twin cables over the stern sheave of the "Dame Caroline Haslett" for the 160 MW 200 kV d.c. Channel link

Two surveys of the sea bed were made before the final route for the cable was chosen, to ensure that it was free from such obstructions as uncharted wrecks. The laying schedule provided for completion of the laying operation within seven hours. In the first stage the cable ship was to move to a point about 800 yd offshore near Dungeness. From this position the shore ends of the cables, already warped on deck in readiness, were to be drawn ashore by winches, using ropes which had been laid the previous day. To prevent damage to the cable by abrasion on the sea bed as it was paid out, floats were attached to the cable. These were later released, allowing the cable to sink to the sea bed. With the shore ends of the cables attached to sand anchors, the cable-laying proper began. Accuracy of navigation was assisted during cable-laying by using a Decca Survey Track Plotter. With this aid, the ship was able to follow a pre-arranged course and to lay the cable to within ±100 yd of the predetermined course. Cable-laying was carried out at a speed of about 3 knots. At the completion of the lay, the seaward cable ends were released on tail ropes attached to marker buoys, ready for recovery by the French cable ship *Ampere* for jointing to be completed.

The British cables run through depths varying from 14 fathoms to 20 fathoms, ending in 15 fathoms at mid-Channel. In planning the laying schedule, a computer was used to take account of predicted tide and weather variations.

Cable Construction

A conventional construction has been used for the two submarine cables. They have a cross-section of 0·525 sq in. and consist of stranded copper wire with an electrostatic

screen. The solid impregnated paper insulation, designed for a stress of 150 kV/cm, is also lapped externally by an electrostatic screen and sheathed with lead alloy "E," protected against corrosion by vulcanised rubber tapes. Armouring on the cable consists of a single layer of 0·232 in. galvanised steel wire with bedding and serving and brings the overall diameter to 3¼ in. The cable weight in water is about 28 lb/yd and the total weight of the two 28,000 yd lengths is 1,200 tons. Should a fault occur, it may be necessary to raise the cable through sand under considerable tension. For this reason, anti-twist tapes have been applied over the lead sheath and under the anti-corrosion protection.

For the land cables, the cross-sections have been increased to allow for the poorer heat dissipation compared with the under-water cables. For cable sections laid in loam, a cross-section of 0·6 sq in. is used, and for shingle areas, 0·925 sq in. The land cables join the submarine cables at Dungeness to the link house at Lydd. Similar cables on the French shore at Le Portel link with the inverter station at Echingen near Boulogne.

After manufacture, the cables were stored in a special shed, from where they could be winched up and fed along an overhead gantry into the holds of the *Dame Caroline Haslett*.

The cable-laying and recovery equipment has been designed so that it can be removed from the *Dame Caroline Haslett* and stored when the laying operation was completed. In the unlikely event of a fault occurring in the cable, the ship can be recalled from her normal duties and refitted with the cable-laying and recovery gear. The longest time envisaged for having the ship available is two to three weeks after detection of a fault in the cable, which may be a considerably shorter time than if a cable ship had to be taken off other duties.

Laying-ship Conversion

The *Dame Caroline Haslett* is a 2,700-ton motor vessel with a length of 230 ft and 40 ft beam. For laying the cable, fairleads are fitted for leading the two cables side-by-side from two holds. The cables pass over "A" frame roller gear and along the deck to the braking gear. This has manual control and specially designed cast-iron shoes to give an even spread of pressure over the cable. Other equipment includes an hydraulic capsule for measuring tension and a yardage counter. The stern sheave, over which the cable is paid out, has a movable, self-adjusting central fin which allows the cable to be aligned against the prevailing current conditions as laying proceeds.

For cable recovery the equipment includes a heavy fabricated bow sheave, a cable repair platform with superstructure, quadrant gears and twin capstan diesel-powered winch gear over one hold consisting of a 90 b.h.p. diesel engine driving a horizontal piston, Williams-Janney pump feeding hydraulic power to two oil motors connected to the mechanical system of the winching gear. The main winch barrels are 8 ft diameter and the cable fleeting action is by both rings and knives. For measuring cable tension and speed a torsionmeter and a d.c. tacho generator are provided. Gear for retrieving the cable is controlled from a console on the wheelhouse superstructure.

Sea Trials

Little experience of d.c. underwater links was available when the cross-Channel project was first under development. Accordingly, a series of sea trials was carried out in September, 1958, with two main objects in view. The first was to find out if the two cables could be laid sufficiently close to one another to ensure that the compass of a ship on the surface would not be deflected by more than 2° as specified.

The second objective was to carry out recovery and jointing of the cable following a simulated fault. Preparations for the trials were outlined in ELECTRICAL TIMES for 25 September, 1958.

For the trials, two half-mile lengths of cable were manufactured. It was found that the two cables could be laid simultaneously and that they remained close to one another on the sea bed. A film taken over the full length of the trial lay by cine-camera showed that here and there the cables overlapped, but this had been foreseen in the cable design and construction stage. The trials also showed that cables and joints were very quickly covered by sand.

Future Prospects

The capacity of the cross-Channel link, 160 MW, represents a relatively small proportion of the generating capacity of both the French and British power systems. Nevertheless, it is a considerable advance on existing submarine links and is therefore in the nature of a prototype. It seems likely that further cables may be laid in the future, since estimates indicate that a power interchange between the two countries of 500 MW would be economical. There is the further possibility that, by the 1970s, there may be a case for coastal submarine links around this country's shores.

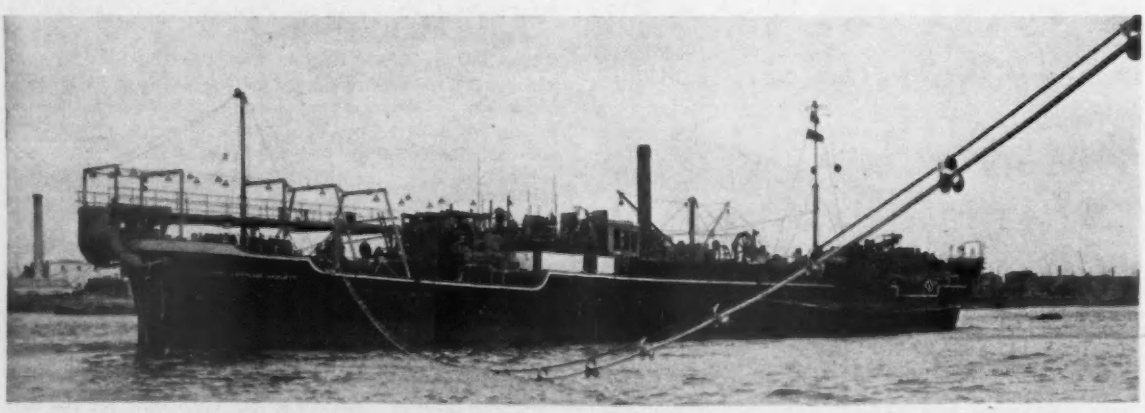


Fig. 3. The m.v. "Dame Caroline Haslett," converted from her colliery duties, taking on cable from the storage sheds. The cable-laying superstructure is designed for removal after the cross-Channel laying operation is completed

Aluminium Lighting Columns are Safe

EXPERIENCES WITH WELDED SHEET METAL DESIGNS

THE use of aluminium for columns supporting public lighting fittings is viewed with some distrust in many quarters possibly because its lightness is presumed to go with inferior mechanical strength and resistance to corrosion. If the experience of Metal Developments (1960) Ltd., of Commercial St, Birmingham 1, is any criterion, such distrust is wholly unjustified.

Sheet Metal Construction

It is now some nine years since this company began to manufacture lighting columns from aluminium alloy (NS4) by forming sheet metal into tubes and welding by oxy-acetylene. The first of these was erected in the forecourt of the company's works at Bilston, Staffs, and has withstood one of the most aggressive industrial atmospheres in the country. Moreover, it was set direct in the local red ash, which is also highly corrosive. Today it still stands and is in perfect condition. The welding, apart from one or two localised spots of thin black staining, shows no sign of preferential weathering attack, either above or below ground.

After five years the company was sufficiently confident to go ahead with production and marketing of Class B columns, 16 ft overall, 14 ft mounting height, to patterns accepted by the Council of Industrial Design. One, "Lucerna," is of circular cross section tapering from 8 in. o.d. at the base to 2¾ in. at the top and the other, "Sheerline," is hexagonal tapering from 6¼ in. across flats at the base to 2½ in. at the top. Both are cut from 12 g sheet supplied by the British Aluminium Co., formed on special machines developed by the company and welded on a "Sigmette" machine, supplied by the British Oxygen Co., using an inert-gas-shielded-arc welding process. In the past three years, over 6,000 of these columns have been delivered and there are orders on the books for 2,000 more. Full-scale production of Class A columns, 25 ft high, is in preparation.

An aluminium public lighting column in a Wolverhampton street struck and holed at the base, but still in use. Inset shows extent of damage suffered

Advantages Claimed

There are many advantages claimed for the aluminium street-lighting column. The most obvious of these is weight, that of a Class B column being only 35 lb. Not only does this enable a considerable number to be loaded on to a lorry of reasonable size—a figure of 70 on a 5-ton vehicle is quoted as against less than a dozen concrete columns—but it ensures both unloading and erecting being carried out without need of cranes. There is, therefore, a major installation cost saving in transport, labour and crane hire. The lighter weight also enables a simpler foundation to be adopted. Aluminium columns can be set direct in concrete, or even hard packed earth, without deterioration, though it is usual to supply them with a bitumastic coating over that part which will be below ground.

Occasionally it may be necessary to install the column where shallow-laid conduit, cables or piping prevent the full depth of foundation being used. With the aluminium column it is usually sufficient in these circumstances to drill two pairs of holes at right angles through the base and insert bars of suitable length to give a stable foundation, in much the same way as the spread roots of a tree, when set in concrete.

This resistance to corrosion is further exemplified by the number that have been erected on sea fronts where they are fully exposed to salt spray, driving winds, rain and sometimes a continued barrage of wet sand and stones flung up by the waves in storms.

This is the treatment which plays havoc with cast iron and steel structures in coastal areas, particularly on piers and breakwaters, penetrating, as it does, beneath any protective finish or paint coating. Aluminium columns may be painted if desired, but the paint will not flake off through rust penetration, nor will it discolour.

Resistance to Impact

Another important aspect is the behaviour under impact from vehicles. Compared with concrete and tubular steel columns, the aluminium column will stand up to higher impact velocities by reason of its greater resilience and plasticity. As the photograph shows, it will yield to quite considerable concentrated impacts without suffering more damage than a dent and certainly without impairing its strength and rigidity. Even when the impact is severe enough to cause the column to collapse over the vehicle or roadway, the lighter mass ensures that harm or damage to property or person will be less than with other forms of column. Unlike concrete, it never shatters.

Cost Considerations

Though the price is at present slightly higher than for steel or concrete, the savings in installation more than outweigh the additional cost making the installed price lower and, of course, maintenance is more economic particularly where environmental conditions are aggressive. Moreover, at the end of their life, no matter how long this may be, they maintain an attractive scrap value.

Among the installations supplied and erected during the past two years are a number of columns supporting fluorescent lighting fittings on a housing estate at Cambridge, columns supporting tungsten filament lanterns on the East Pier, Dun Laoghaire, Eire, and columns on the sea front at Deal. The last two installations have now been exposed to particularly severe marine conditions for close on two years without deterioration. Recently, prototype Class A columns, with fluorescent lanterns, have been installed on Prebend Bridge, Bedford.

Aluminium "Lucerna" columns on Deal seafront

NEW LITERATURE

The Dielectric Circuit

by P. Kemp, M.SC.(TECH.), M.I.E.E.

UNDER a somewhat misleading title this addition to a monograph series sets out to give a rather fuller treatment to subject matter sometimes referred to as "electrostatics" in standard textbooks on electrical engineering. The book's scope in fact embraces electrostatic field theory with a special chapter on potential gradient, calculation of capacitance and its effect in relation to static, sinuosoidal and transient voltages and a concluding chapter on dielectric measurements. Written for degree students and to serve as refresher for practising engineers, a not too rigorously mathematical approach has been adopted. From the point of view of the engineering student, however, the author lays himself open to criticism in sticking to e.s.u. and practical units without apology or even mention of the existence of the MKS system. Published by Chapman and Hall, 219 pages, 5½ in. by 8½ in. Price 45s.

Michael Faraday

by A. E. Jeffreys

MR JEFFREYS is not by any means the first classical scholar to become interested in Michael Faraday and his unparalleled scientific achievements. He is, however, among the very few who have taken the trouble to collate all of Faraday's lectures and published writings and present them, in chronological order, as a reference volume. In all, he has located 489 references, the last seven of which are after his death in 1867, and innumerable reprints, translations (including a couple into Basic English) and abstracts. These he has presented with an admirable foreword by Sir Lawrence Bragg and an introduction which discloses the extent of the effort which the collation has involved. There are also a number of interesting illustrations. Published by Chapman and Hall, 72 pages, 9¾ in. by 7 in. Price 42s.

Modern Wiring Practice

by W. E. Steward, ASSOCIATE I.E.E.

FIVE editions in less than ten years pay tribute to the value of this slim and extensively illustrated volume on wiring domestic and industrial premises. It is based firmly on the thirteenth edition of the IEE Wiring Regulations, and the early part of the book is devoted to a review in practical terms of the requirements of the Regulations. Thereafter, the various wiring systems available are reviewed, with considerable detail on installation techniques, and constant reference back to the detail of the Regulations. Final chapters give a round-up of types of accessory, of earthing requirements and of testing and inspecting installations. This last is one of the less satisfying sections of a generally excellent book, offering little discussion of the difficult question of earth-fault loop testing. Published by Newnes, 228 pages, 9 in. by 6 in. Price 25s.

Video Tape Recording

by J. Bernstein

THE recording of television programmes on magnetic tape, already extensively used in this country for black and white, is also widely used in America for colour. American authors often show a knack of expressing difficult technical ideas in simple and easily read books, and in this book Mr Bernstein shows this technique in progressively describing the simpler electronics of picture production to the more complex elements of the magnetic tape colour recording systems. The first three chapters are devoted to an outline of the television system and how colour signals can be transmitted. Subsequent chapters deal with the construction of tape recorders, and how their design is affected by such factors as timing errors and recording head bias. One chapter is devoted entirely to servo systems for recorders. In the concluding chapters, circuitry is examined in more detail and with references to colour correction circuits, clippers, delay lines and other circuit components. Published by Chapman and Hall, 268 pages. 9 in. by 6 in. Price 72s.

BOOKS RECEIVED

Technical Data on Fuel, ed. by H. M. Spiers. Comprehensive collection of tables, charts and technical information appropriate to fuel technology. Published by British National Committee, World Power Conference, 360 pages, 11 in. by 8½ in. Sixth edition. Price 60s.

Control of Nuclear Reactors and Power Plants, by M. A. Schultz. Account of servo mechanism techniques for control of nuclear power plants, intended for nuclear station control engineers. Published by McGraw Hill Publishing. 462 pages, 9 in. by 5¾ in. Second edition. Price 97s.

Symposium on Active Networks and Feedback Systems, ed. by J. Fox. Proceedings of symposium held in New York in 1960. Published by Interscience Publishers Inc., 658 pages, 8½ in. by 5½ in. Price $8.

Classified Examples in Electrical Engineering, Vol. 2, by S. Gordon Monk. The latest revision of this long established volume provides problems in Part 2 suitable for HNC students, and to some extent for those studying for Part 3 of the IEE examination. Published by Sir Isaac Pitman, 295 pages, 7½ in. by 4¾ in. Seventh edition. Price 21s.

ARE BRITISH STANDARDS TOO HIGH?

"IT is all very well to maintain high standards in industry, but what if those standards price us out of competitive markets where lower standards are acceptable?" This is by no means a new argument and it was again raised at this year's Standards Engineers' Conference, the seventh in the series. For the first time the conference lasted two days, the first being held at the Connaught Rooms with Sir Stanley Harley in the chair, while the second was given over to a series of sessions at British Standards Hse.

Opening the conference, Viscount Hailsham, Lord President of the Council and Minister of Science, said that an efficient economy requires standards, but they cannot be imposed from without. They must result from discussion between the producer and the user, they must blend scientific knowledge and commercial experience and they must be clear and intelligible. Moreover, they must be kept up to date with progressive knowledge and experience.

It was Mr I. Maclean who raised the question of too high a level of standards in his paper on "Standards and Market Research" and appealed for the setting up of a market research committee to advise on the setting of standards of performance for products destined for competitive markets. In his view some of the present performance standards were set at an unnecessarily high level and could be lowered. Transformers requiring to be operated only intermittently need not be rated on a 24 hr basis. Standards for flameproof enclosures in Britain were higher than those on the Continent and were not necessary where explosion risks were almost negligible. In the building trade, the requirement that a crane should be able to withstand a wind force of 110 m.p.h. seemed excessive, since the highest figure recorded in 33 years in London was 77 m.p.h.

Mr J. I. Willmore took the other view, remarking that "we all know about dams that burst and cranes that get overloaded. Our standards are the highest in the world. Let us keep them that way." Mr Doughty said that trade unions were in favour of standardisation, but it was not enough in itself. It must be accompanied by simplification and specialisation.

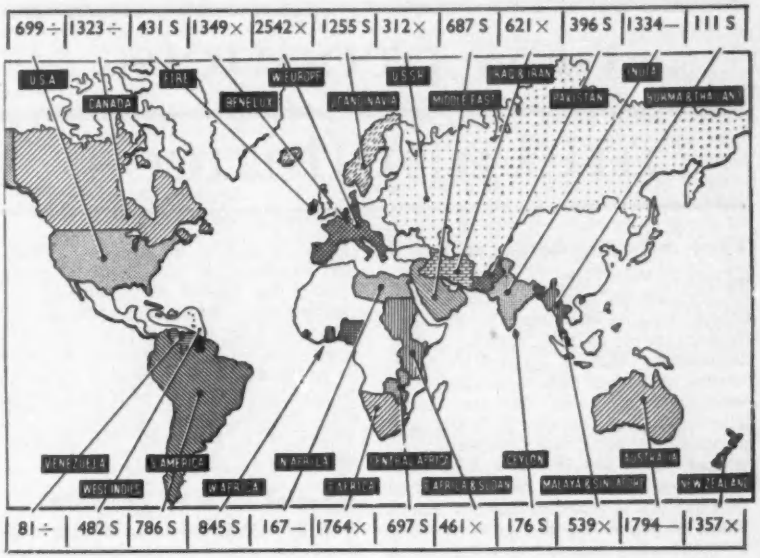
Mr Egan, dealing with standards in the electronics industry, mentioned the difficulties of a fast growing and ever-changing industry, but there were certain factors, such as the geometry of valve caps and bases, which could be, and had been, usefully subjected to standardising.

Mr Binney, reporting progress on the BSI Register of Standards Associates, formed last year, said that it had got off to a good start and that there were already 300 on the register.

The conference was attended by some 230 engineers and others concerned with the industrial application of standards. The discussions following the various papers were lively and instructive to all present.

Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S=10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures.



EXPORTS IMPORTS

April

WITH fewer working days in April, because of the incidence of Easter, exports of electrical goods during the month, at £24,932,890, were nearly £1 million down on the corresponding figure for March. The main reductions were most evident in the domestic appliance sphere, where, although the total exports, amounting to £2,763,915, were over £400,000 up on a year ago, the figure is more than £250,000 down on March. Exports of washing machines and refrigerators were maintained at a high level. Of the refrigerators, Canada took the largest amount—£66,435. In increased exports of fans, the ceiling type accounted for £135.267 of the total.

On the heavy plant side, transformers of over 7,500 kVA totalled £630,002 compared with £345,272 for those not exceeding 7,500 kVA.

There was also an improvement in cable exports, of which Chile took £189,969, and India £160,921 in value.

But our best customer for various types of electrical goods for the month was Australia with a total of £1,794,169, closely followed by South Africa at £1,764,901, and India at £1,334,867. Even the Netherlands took goods to a value of £1,017,935, which included £576,073 for radio and electronic gear.

Of our imports, at £5,395,907, the largest proportion—£1,561,164—came from the USA, followed by West Germany at £812,051, and the Netherlands at £621,316.

Description	Exports Value (£)		Imports Value (£)	
	April 1960	April 1961	April 1960	April 1961
Generators				
Diesel up to 200 kW	520,516	379,531		
Diesel over 200 kW	206,746	207,085		
Steam turbine driven	63,564	54,820		
Water and gas turbines	482,956	881,547	47,012	95,836
With i.c. and other prime movers	7,944	55,867		
Generators up to 200 kW	141,850	120,773		
Generators over 200 kW	236,935	84,782		
Generator parts	1,470,904	284,351		
Motors, f.h.p.	302,906	335,381		
Motors 1-250 h.p.	489,063	514,972	162,976	191,426
Other motors	472,332	377,094		
Motor starters and controllers	274,800	342,915		
Convertors and rectifiers	73,814	85,289	100,267	178,702
Transformers	938,410	975,274		
Switchgear, to 200 A, mv	366,970	585,239	108,170	193,739
Switchgear, other	1,307,792	1,256,824		
Total, Electrical Plant	*7,257,502*	*6,641,744*	*418,425*	*659,703*
Batteries, primary and parts	615,915	622,433		
Lamps filament, over 28 V	112,113	133,285		
Lamps filament, under 28 V	32,758	35,031	79,514	109,184
Fluorescent tubular lamps	71,447	86,955		
Other lamps and parts	83,882	130,927		
Radio and electronic gear	4,261,398	4,925,045	1,193,673	1,411,558
Telephone and telegraphic equipment	1,602,834	1,944,870		
Cookers	55,627	47,527		
Other cooking appliances and parts	143,812	121,655		
Space heaters	22,648	30,942	149,302	246,155
Water heaters	30,896	41,374		
Other heaters and parts	99,347	141,162		
Electric irons	62,406	66,384		
Vacuum cleaners	161,785	209,135		
Floor polishers	66,858	46,636		
Food mixers	46,653	79,779		
Washing machines, domestic	524,223	535,768	240,462	98,036
Dryers	12,712	36,613		
Washing machine and dryer parts	98,847	167,710		
Domestic refrigerators and parts	771,598	845,947	969,617	254,933
Other appliances and parts	238,776	399,283		
Total, Domestic Appliances	*2,336,188*	*2,763 915*	*1,359,381*	*599,124*
Portable power tools	282,703	332,088		
Arc welding plant	96,241	176,199	57,358	70,776
Resistance welding plant	29,836	48,594		
Electric furnaces	128,951	99,355		
Signalling apparatus	102,105	119,908		
Commercial instruments	181,717	190,298	60,694	99,153
House service meters	180,832	134,459		
Wiring accessories	213,729	249,232		
Fans	126,016	164,090		
Lighting fittings and lanterns	359,102	354,204	118,837	135,658
Other lighting equipment	83,562	111,101		
Telephone and telegraph cable	398,167	507,796		
Paper insulated cables	545,418	551,189		
Rubber insulated cables	226,738	283,555		
Thermoplastic insulated cables	355,306	374,130		
Winding and similar wires	140,480	181,795		
Other cables and wires	224,912	240,436		
Total, all cables and wires	*1,891,021*	*2,138,901*		
Accumulators and parts	338,266	403,727		
Insulating materials	191,536	227,215		
Industrial electronic control gear	184,313	202,001	82,282	105,713
Electrical ware	101,561	136,895		
Permanent magnets	53,920	78,520		
All other articles	3,177,259	3,266,682	1,549,648	2,205,038
Total	24,096,707	24,932,890	4,919,812	5,395,907

new products and appliances

Floor- and ceiling-heating cables

SUPPLEMENTING their existing "Ashatherm" range of floor-warming cables, Aerialite announce a lower-priced version known as the "Popular" range. Conductors are of Kumanal alloy, enamel insulated and sheathed overall with 0·045 in. radial thickness tough-grade p.v.c. Supplied with 10 ft cold tails, standard elements are available with ratings from 500 W to 3 kW. Also announced is the new Aerialite ceiling-heating system recommended for rooms where floors are of timber or where intermittent heating only is required. *Aerialite Ltd., Castle Wks, Stalybridge, Ches.*

Three-in-one washer

WASHING, rinsing and spin-drying are all carried out automatically in the latest Bendix home laundry unit, "Triomatic," briefly referred to in the last issue. Simplicity of control is a keynote of this 135 gn luxury machine, which came on the market today. These controls, set at the back of the working-surface top, comprise four dials, a changeover switch, and the device to control the washing and drying sequences. "Triomatic" washes and drys in the same cabinet. Washing cycle is followed by a spin-drying programme and then heat drying by means of tumble action with a 2½ kW heater completes the sequence. In common with other Bendix washers, this machine should be connected to the plumbing, but it can be alternatively used without permanent plumbing connections by means of flexible hoses with special tap adaptors.

The washer is automatically filled and a water level control ensures the correct amount of water for various loads which can be up to 9 lb dry weight of clothes. An impeller-type large-capacity pump empties the washer after washing and rinsing cycles. The familiar porthole door set in the front panel is at a convenient height for loading. Finishes are in white or cream stove enamel and it measures 36 in. high by 25½ in. wide and 25½ in. deep. *Bendix Home Appliances Ltd., Albion Wks, Kingsbury Rd, Birmingham 24.*

New Bendix three-phase washer provides a working surface beside a 'fridge

Increased output h.f. generators

IMPROVEMENTS to an existing range of h.f. generators for induction furnaces have enabled output rating to be increased without any corresponding alteration to floor area occupied by the equipment. The four units concerned, originally covering outputs from 15 kW to 40 kW, have now been uprated to the range 18 kW to 45 kW. This has been achieved by using special heat transfer jackets with the oscillator valves, cooled by a powerful centrifugal blower. This conversion can readily be carried out on equipment already installed on customers' premises. The valves have silica envelopes and are guaranteed to give a working life of 6,000 hr. Protection is afforded by both low grid current and overload anode current tripping, this being said to be superior to the more usual thermal overload protection. Stepless control of generator output is effected by means of grid-controlled thyratrons in conjunction with a phase shifting transformer. *Wild-Barfield Electric Furnaces Ltd., Elecfurn Wks, Otterspool Way, Watford, Herts.*

Transistor photo-electric detector

AMONG advantages claimed for a new photo-electric detector, the "Type CF69A," are high sensitivity and compact size; the transistorised amplifier unit can be conveniently accommodated in existing control equipment where space may be limited. The photo-transistor detector, mounted in a robust, cast-metal housing, is exposed to a light beam from a 24 V projector lamp having a housing similar to the detector. The lamp is rated at either 3 W or 6 W and has a guaranteed life of 5,000 hr. The device is said to be able to detect interruptions to a 6 ft light beam by objects as narrow as 0·015 in. and to give stable performance at temperatures up to 60°C. Applications include measurement, counting and detection of cracks or tears in material. Having dimensions 6 in. by 6 in. by 3 in., the amplifier is suitable for 200 V to 250 V a.c. supplies and is stabilised against voltage fluctuations; alternatively, 12 V or 24 V battery supplies may be used. Two models of the equipment are available, a standard model, and a more sensitive version costing £22 16s. *Cableform Ltd., Romiley, Ches.*

Radiator shelves

SHELVES to fit on top of their radiators are now being marketed by Hurseal and Gulf Radiators. They are intended for use wherever the radiator cannot conveniently be positioned under windows and are designed to prevent heat marks on walls. Shelves are available in two widths to fit both panel and column radiators and can be in any length. They are finished in stove enamel and supplied with a self adhesive foam rubber strip to ensure a close fit between shelf and wall. Prices for panel radiator widths are 10s for the first foot and 5s for every additional foot. For column radiators the price is 15s for the first foot and 7s 6d for each additional foot. *Hurseal Ltd. and Gulf Radiators Ltd., 229 Regent St, W.1.*

Auxiliary alternator range

GOOD voltage regulation and high output to weight ratio are among advantages claimed for the "Stamford L" range of self-excited alternators for marine and other auxiliary and standby supplies. The range has recently been extended and now covers outputs from 97·5 kVA to 300 kVA, three-phase at 50 c/s and 60 c/s, with five basic frame sizes. The design employs a transformer-rectifier compensating circuit which achieves voltage regulation of ±2½% from zero to full load at power factors from unity to zero lagging; variations in drive speed of ±4% are also compensated for. Feature of the circuit is the inclusion of a reactor to reduce effects of temperature on regulation. The reactor is pre-adjusted at the factory to give the required alternator output voltage. Initial excitation is supplied by a permanent magnet exciter connected through a blocking rectifier, main excitation being derived from a rectified output from the alternator. Insulation, which is impregnated for tropical conditions, is Class "E" for the stator and Class "B" for the rotor. *Arthur Lyon and Co. (Engineers) Ltd., Park Wks, Stamford, Lincs.*

One of the "Stamford L" range voltage regulated alternators

Load-reducing cut-out

A DEVICE for reducing loading on their high rated hotplates when the pan is removed has been developed by Jackson for their commercial cooking equipment. When the base of a pan is in contact with the hotplate, heat is absorbed by the utensil; when it is removed, however, the auto thermal unit situated beneath the hotplate reduces loading from 3 kW to 1·9 kW. This action takes place after the hotplate is left uncovered for a period of 10 min to 13 min, but when a pan is replaced, the full loading is resumed after a period of approximately three min. It can be incorporated in any of the Jackson 16, 17 and 19 commercial cooker ranges. *Radiation Catering Equipment Ltd., Radiation Hse, North Circular Rd, N.W.10.*

Multi-range test meters

RECENTLY made available in the UK are two versions of Bach-Simpson multi-range, a.c./d.c. test meter, the "Type 260" and "Type 270." These instruments are basically similar except that the latter version incorporates an anti-parallax mirror and knife-edge pointer. There are five voltage ranges covering 0-2·5 V to 0-1,000 V with a sensitivity of 20,000 ohms/V on d.c. and 5,000 ohms/V on a.c. Four current ranges cover 0-1 mA to 0-500 mA, while the resistance range can be extended by switching in various multiplying factors. Accuracy of measurement for d.c. ranges is claimed to be 1·25%. Of rugged construction, the instruments are said to give dependable service. Built-in protective features include circuit fuses, current limiting diodes and spring-loaded jewelled bearings. *Aveley Electric Ltd., Aveley Industrial Estate, South Ockendon, Essex.*

Wired component printing machine

PRINTING and coding of cylindrical electronic components can be handled by a recently introduced automatic machine at the rate of up to 3,600 components/hr. Intended specifically for components having coaxial wiring leads, the machine has a special feeding mechanism and can accept components varying in diameter from 0·08 in. to $\frac{7}{8}$ in. with body lengths from $\frac{1}{4}$ in. to $3\frac{1}{4}$ in. long. The components can be marked with letters or figures anywhere along the length of the body. They can also be colour coded if required. *Rejafix Ltd., 81-83 Fulham High St, S.W.6.*

Moisture repelling fluid

CLAIMED to have the property of penetrating pores and cracks and displacing absorbed moisture, recently introduced "Hellermann CRC 2.26" fluid can also be used as a lubricant and to provide a protective film against metallic corrosion. Other applications include "drying out" and restoring to operation electrical equipment which has been exposed to moisture or even totally immersed in water. The fluid is normally available in a 16 oz aerosol dispenser, but can also be supplied in 1 gal and 5 gal cans or 55 gal drums for immersion of water logged equipment. *Hellermann Ltd./Bowthorpe Electric Co. Ltd., Crawley, Sussex.*

Flexible batch-counter range

IMMEDIATE availability from stock to match a wide range of specialised customer requirements is one of the features claimed for the new "BC" range of electronic batch counters for industrial process control. This has been achieved by designing basic units which can easily be modified to suit particular applications by addition of appropriate components or printed circuit sub-assemblies. Individual equipments are capable of counting at the rate of up to 20,000 objects/min from microswitch, photocell or magnetic pickup inputs. The front panel, accommodating dekatrons, batch selector switches and other controls, is dust-tight and suitable for standard panel, rack or cabinet mounting. Cabinets supplied have a cast metal projecting frame giving protection to the instrument facia. *Electronic Machine Co. Ltd., Mayday Rd, Thornton Heath, Surrey.*

Permanent magnet separator

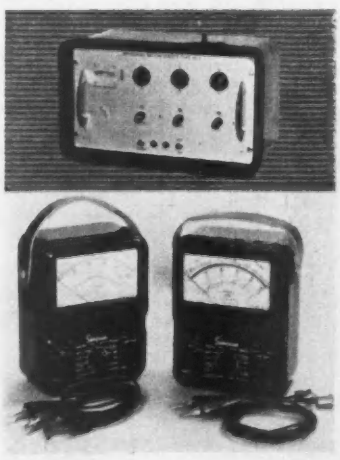
FOR separation of iron particles from processed material carried by conveyor belt, the "Andox 5" magnetic pulley employs permanent magnets of high coercivity barium ferrite ceramic. The material enables radial pole construction said to give flux intensities equivalent to those produced by electromagnetic type separators. Flux distribution is graded to conform to depth of burden on a transverse plane of the conveyor and the main body of the pulley is of stainless steel to ensure long life. The pulley is available in diameters from 12 in. to 24 in. to suit various belt widths. *Rapid Magnetic Ltd., Lombard St, Birmingham.*

Multi-pole encapsulated relays

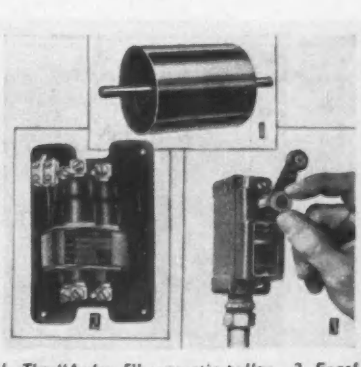
MULTI-POLE versions of an existing range of single-pole encapsulated mercury switch relays are soon to be available. They will have ratings of 15 A or 30 A with operating coils rated at 2 W d.c. or 2 VA a.c. Having no exposed moving parts these units are said to give reliable service under extreme environmental conditions. Later, a single-pole version of this relay having a switching capacity of 60 A will be introduced. *Engel and Gibbs Ltd., Elstree Way, Boreham Wood, Herts.*

Adjustable limit switches

ACCURATE setting is ensured with two new limit switches recently added to the "Class 9007 Type AW" range. The first has a slotted roller arm, graduated in tenths of an inch, whose effective length can be adjusted between 1 in. and 4 in. by loosening a retaining nut. The second switch has an arm which can be set at any angle through 360° by means of a micrometer on the spindle; one complete turn of the micrometer dial rotates the arm through 20°. Arms are available with lengths from $\frac{1}{4}$ in. to 3 in. Rollers for both types of switch can be placed on the inside or outside of the arm and have dimensions $\frac{1}{4}$ in. dia by $\frac{1}{4}$ in. wide. *Square D Ltd., Cheney Manor, Swindon, Wilts.*



Top: Batch-counter in Electronic Machine Co's "BC" range. Below: Bach-Simpson multi-range test instruments



1. The "Andox 5" magnetic pulley. 2. Engel and Gibbs encapsulated mercury switch relay, multipole version. 3. Limit switch by Square D has micrometer adjustment

TRADE PUBLICATIONS

KLOCKNER-MOELLER.—Catalogue giving prices and dimensions of products by Klockner-Moeller, Aylesbury.

POWER CONSTRUCTION.—A pictorial booklet showing some of the power station equipment supplied by member companies of the Power Construction Consortium. Power Construction Ltd., St. Swithin's Hse, Walbrook, E.C.4.

RICHARDSONS WESTGARTH.—Three illustrated brochures giving details of water tube boilers, wet back shell boilers and vacuum flash evaporators. Richardsons, Westgarth and Co. Ltd., Wallsend, Northumberland.

AWCO.—Booklet illustrated with colour and monochrome plates detailing developments in plant and products. Aluminium Wire and Cable Co. Ltd., 2 St. James' Sq, S.W.1.

A.S.P.—Brochure detailing uses, properties and advantages of "Aspect" p.v.c. pipes. Allied Structural Plastics Ltd., Watford.

WARDS.—Illustrated booklet detailing work carried out by Thos. W. Ward Ltd., Albion Wks, Sheffield.

Torque/speed unit price cut

A REDUCTION of £8 in the price of all "TASC" torque and speed control units is announced. Working on the electromagnetic induction principle, these units can be coupled to any type of prime mover to produce either variable speed or constant torque outputs. Advantages claimed are that, compared with an electric motor, a "TASC" drive has quick response due to low inertia and no wearing parts such as slip-rings or commutator. Applications include machine tool and mixer drives. Delivery is two weeks from receipt of order. *Pye Electric Ltd. (Lowestoft Division), Lowestoft.*

Thermal storage charging control

TO improve the degree of anticipatory control over the charging period in domestic underfloor storage heating, the "Satchwell Ratiomatic" system employs two temperature detectors interconnected to work in conjunction. One is a type "TMA" thermostat, mounted outside the building, the other a type "TL" thermostat placed inside. Depending upon weather conditions during the 12-hr charging period, the thermal charge given to the floor is varied between zero and 100%. Charging is arranged to commence at the beginning of the off-peak period, the amount of charge being regulated by variable "on/off" cycling. The outside thermostat responds not only to ambient temperature, but also to the effect of wind. The inside thermostat is particularly sensitive to any drop in room temperature, but remains unaffected by transient temperature rises. *The Rheostatic Co. Ltd., Slough, Bucks.*

NEW G.E.C. DIVISION LAUNCHES TEN APPLIANCES

FOLLOWING the reorganisation in GEC the subsidiary. GEC (Domestic Equipment) Ltd., becomes fully operational today. As evidence of its dynamic future policy, ten new domestic appliances have been introduced.

Largest of these appliances is a 4·3 cu ft compressor refrigerator, DE430, an austere version of the DE44. Basically similar in design it lacks such accessories as plastics table top and salad drawer, but retains the full width freezer and chiller tray. Its door is magnetically sealed and finishes are either white or honeysuckle. The price? 49 gn including purchase tax. Two irons, one lightweight and the other medium, join the range. Feature of these is the precision thermostat, which can be regulated with minimum trouble by means of a simple gauge. The handle is of hollow construction for cool handling and frontal portion can be removed for ironing sleeves. Relatively inexpensive, they cost £2 13s 6d for a cream and £2 16 2d for chrome.

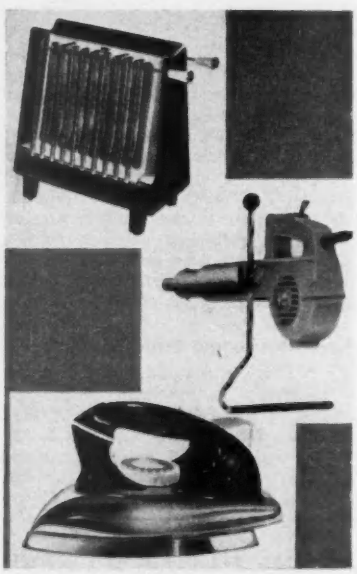
In competition with non-automatic toasters is the D5630 model selling at £2 14s 6d. Loaded to 650 W it has two elements—one either side—and bread is held in place by chrome grills. It is easy to clean and the body has a black lustre.

Fires and wall heaters have been extensively redesigned, five new models being launched. A free-standing screen-type fire at 15 gn gives both convected and radiant heat. It has a 500 W convector element with three-heat control and either a 1 kW or 2 kW radiant heater. Standing 27½ in. high it is 20½ in. wide by 8½ in. deep and finished in bronze/gold. A new 2 kW reflector radiator is fitted with a visor guard which is easily removed to facilitate cleaning the chrome reflector. Finishes are in cygnet and grey or flame and grey, and the price is £3 12s 6d.

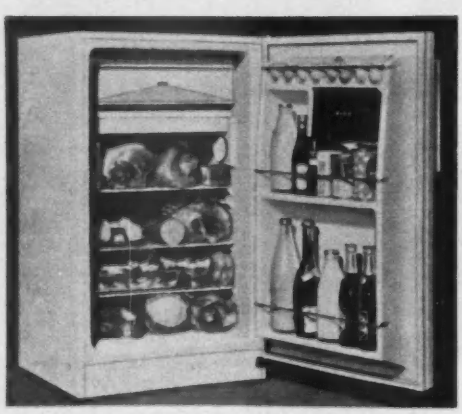
A well-designed 2 kW convector heater has clean lines and pleasing appearance. It is fitted with a 750 W radiant element and illuminated for effect. The radiant heater can be switched on when required and the convector is controlled thermostatically. Finished in Flamingo and gold, this model is scheduled for September delivery and will sell at £12 17s 6d. A less expensive model without the radiant heater will cost £8 14s 5d and should be on the market in early July. Also available in July will be the infra-red wall heater for bathrooms and kitchens. Loaded to 750 W the infra-red element is encased in a quartz tube. Frontal guard is easy to remove and this model has a honeysuckle and old-gold finish. Its price will be £4 5s 6d.

For contemporary styling a reflector model gives both heat and illumination. A twin element fire fills the lower half of the fire and a glass panel the upper. A lower-powered lamp gives muted light through the frosted coloured panel giving an unusual effect. Finishes are in a variety of colours and it sells at £9 17s 6d.

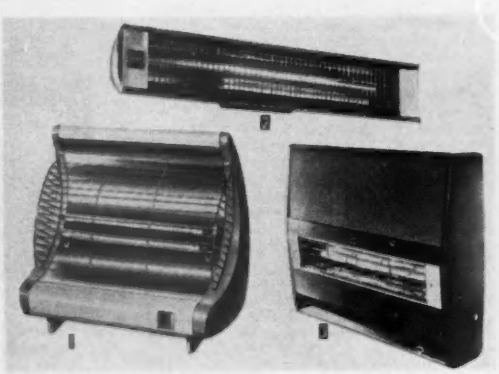
Already familiar, GEC's firelighter, which came on the market eight months ago, has undergone several modifications. The new model, selling at 6 gn, has had its stand shortened, and a brighter finish given to the barrel which has been slightly straightened. It is so efficient that it will light a cigarette in a matter of seconds. *GEC Ltd., Magnet Hse, Kingsway, W.C.2.*



Three of the new appliances: the iron, 650 W toaster and redesigned firelighter



Austere version of the DE44, the 4·3 cu ft DE 30 'fridge



1. 2 kW reflector radiator. 2. Infra-red wall heater for bathrooms and kitchens. 3. Well designed 2 kW convector heater with 750 W radiant element

POWER SUPPLY

Statistics for April

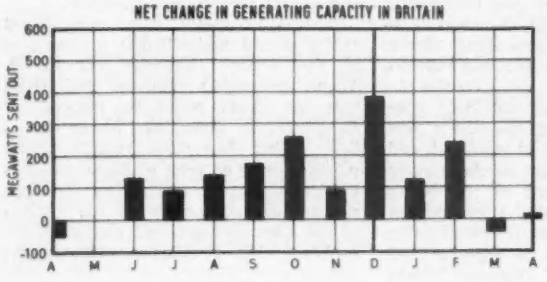
A SHARP decline in electricity generated in Great Britain is generally noticeable at this time of year and April was no exception with generation falling from 11,236 million units in March to 9,835 million units, or 7·5% above the corresponding total for April last year. Generation by the CEGB totalled 9,100 million units, while the totals for the SSEB and the NSHEB were 516 and 219 million units, respectively. Generation by steam accounted for 9,571 million units, with water power adding a further 251 million units. The total electricity sent out was 9,252 million units.

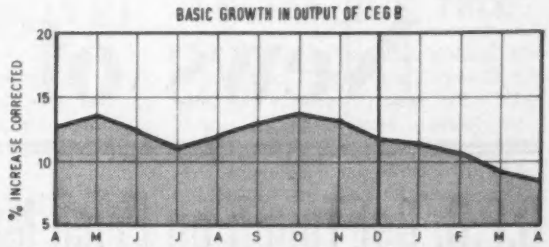
Although the generating capacity of the CEGB rose slightly during the month to 27,095 MW output capacity, in fact no new plant was commissioned and the increase must be attributed to rerating or recommissioning of plant. No change was reported in the generating capacity of the NSHEB at 1,045 MW, but the SSEB output capacity fell slightly to 1,748 MW as a result of decommissioning of plant now obsolete. The 15 MW reduction in capacity of the SSEB represented the output of three small sets at Dunfermline which were taken out of service during the month. Four 25 klb/hr boilers at Dunfermline and another 50 klb/hr boiler at Bonnybridge were also taken out of service by the SSEB. The sent out capacity of the slurry-burning station at Barony was also reduced slightly from 56 MW to 54 MW during April.

Electricity Board Sales Progress in April

Board	Electricity sent out in millions of units	% Increase on April 1960
London	720·4	3·4
South Eastern	512·6	2·3
Southern	725·7	10·1
South Western	338·7	9·7
Eastern	832·5	6·5
East Midlands	681·7	8·3
Midlands	888·1	4·3
South Wales	492·1	1·5
Merseyside and N. Wales	546·4	9·9
Yorkshire	924·0	12·8
North Eastern	525·4	10·3
North Western...	905·2	9·6
Direct Supplies by CEGB	311·5	1·6
CEGB Total	8,404·3	7·2
South of Scotland	698·1	14·0
North of Scotland	153·8	9·4

Table excludes area board purchases from other sources.

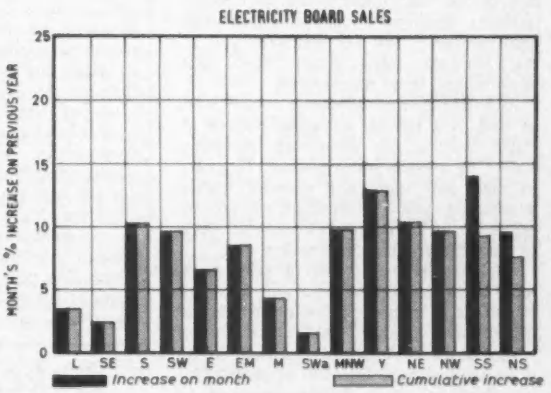


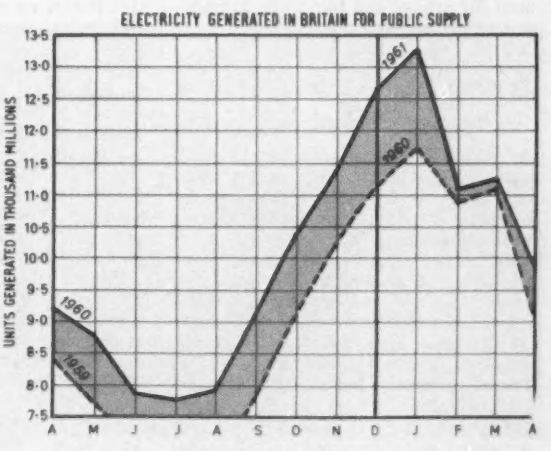


The increase in units of electricity sold by the CEGB was 8·5% above the corresponding month last year, after correction for temperature and number of working days. The actual increase was 7·2%, a marked increase over the two preceding months.

Cumulative and actual increases in electricity sent out by the area boards correspond for this first month of the financial year and show only three boards exceeding last year's figures by more than 10%. For the mainly industrial areas the increase was 8·3% while for the remaining areas the increase was 6·2%. SSEB sales rose appreciably during the month to 14% above April last year, raising the cumulative increase since the beginning of the year to 9·1%. The NSHEB sales also rose to 153·8 million units or 9·4% higher than in April last year.

Referring to the statistics for March, we regret an error in the figures for the SSEB. Electricity sent out was 792·7 million units, an increase of 4·9% and not the published figure of 597·5 million units with 2% decrease. On the "Electricity Board sales" graph, the monthly and cumulative increases should have been 4·9% and 7·8%





News of the Week

G.E.C. Get Tough on Price Maintenance

Ten new appliances in "attack on market"

DETERMINATION to uphold resale price maintenance to the extent of litigation is one of the big guns of GEC (Domestic Equipment) Ltd.'s new policy expressed by the managing director, Mr Charles F. Richards, last week. This prefaces a "vigorous attack" on the domestic appliance market which the new company launch today when they commence trading as a fully operational unit. This attack is evidenced by the launching of 10 new appliances, details of which appear on page 884.

"Resale price maintenance is one of the big planks in my platform," said Mr Richards, "and the company will not hesitate to apply for an injunction if any of our appliances are sold below the fixed resale price." Each wholesaler of the company's products signed an agreement to the effect that he would maintain prices, the object being to circumnavigate discount houses and cut price establishments. As Mr Richards put it, the company have sought bona fide national and large distributors.

Redistribution of wealth in recent years as well as a rapidly changing pattern of retail distribution gives the company access to a great mass market. In order to meet this increasing demand higher production will be attained by greater efficiency in the company's methods both in manufacture and distribution.

"Substantial economies in sales costs have already been effected and a policy of intensive concentration on wholesale distribution adopted," said Mr Richards. "Against the background of a virile home demand it already becomes apparent that we shall be much better equipped to meet the intense and increasing competition in our overseas markets."

Under the policy of decentralisation the headquarters of the company move to Hanger La, Ealing, and two central stores are at Greenford, Middx, and Swinton, Yorks. This means that retailers will have to place orders through the wholesalers who, say the company, will be heavily stocked. For the purposes of service the country has been divided into four, and area offices are at Glasgow, Manchester, Birmingham and London.

Second Attempt at Electrical Fair

MR P. A. THOROGOOD, general manager of the Electrical Engineers' Exhibition, has obtained an option on part of Olympia during August, 1962, and is resuming his proposals to stage an exhibition of domestic electrical appliances. An earlier plan to stage the exhibition in 1960 fell through because space at London's principal exhibition halls was unavailable and insufficient support was forthcoming for Alexandra Pk as a venue, after that hall had been booked for the last week of September. Now Electrical Fairs Ltd., created in 1960 as a subsidiary of Electrical Engineers (ASEE) Exhibition Ltd., is circulating potential exhibitors to test support for a show at Olympia.

Polymerised CO_2 possible clue to reactor coolant behaviour

A RECENT discovery by UKAEA scientists, that carbon dioxide molecules can exist in polymeric form, may be of some significance in nuclear reactor coolant studies. In particular, it is thought polymerised molecules may have something to do with the interaction of carbon dioxide and graphite in AGC reactor systems. Experiments carried out by the Authority's Reactor Technology Branch, Capenhurst, using a mass spectrometer, detected the presence of polymerised carbon dioxide ions in multiples from $(CO_2)_2$ to $(CO_2)_{23}$ at gas pressures between 1 atmosphere and 5 atmospheres.

GO-SLOW AT POWER STATIONS

BACKING demands for an increase in pay of 8d an hour, skilled maintenance men at several London power stations of the CEGB have initiated an unofficial "go-slow" campaign. They have adopted a modified work-to-rule system which has not affected output of any of the power stations, but may prolong overhaul time. Most of the men involved in the campaign are members of the ETU and the AEU it seems. Although there have been reports that a new pay claim is being worked out, no claim has yet been officially submitted.

E.E. bid for Dorman

AN offer worth just over £2 million has been made for W. H. Dorman and Co. by English Electric Co. Ltd. Dorman's are the neighbours of EE's works at Stafford, and make diesel generating sets and high-speed oil engines. In January, 1959, Dorman acquired W. G. Bagnall, locomotive manufacturers.

The stock market has been expecting the bid, but is surprised at the differential between voting and non-voting shares, offered—13s 5d and 9s 7½d respectively. Nevertheless, Dorman directors accept.

TELEPHONE TAKEOVER

E. SHIPTON AND CO., telephone engineers, have acquired for £5,100 Gate Electronics (Works) and R.F. (Electronics) Developments, respectively manufacturers and hirers of telephone answering equipment.

Lakeland Power Lines Decision

DECISION on the plan for overhead lines to supply electricity to Upper Borrowdale in the Lake District has partly gone against the North Western Electricity Board. The matter was the subject of a public inquiry on 14 February. The Minister of Power has now accepted the recommendations of the inspector. He has refused consent for an o.h. line from Chapel House to Stonethwaite, and between Thornythwaite and Seathwaite. But consent has been granted to an o.h. line from Longthwaite to Glaramara Guest House and for l.t. distribution in Seatoller. From Glaramara Guest House to Seatoller village the line will have to go underground.

For some years there has been controversy as to whether the power line should be underground or overhead, and at one time, in an effort to reach early agreement, the chairman of the North Western Electricity Board suggested the use of plastics insulated overhead cable for parts of the lines to Seatoller and Seathwaite. But the National Parks Commission was uncompromising, so the Board reverted to their earlier proposals and sought the Minister's consent.

It was estimated that underground cables would add £10,000 to the cost of the scheme (although Mr K. H. Tuson, consulting engineer, maintained that the figure could be reduced by £4,000 if the cable was placed across fields rather than along roads). At the public inquiry an offer of £5,000 towards the extra cost of placing all the lines underground was made by the Friends of the Lake District, and last week, the secretary, Mr P. Cleave, repeated the offer.

FLATLEY SEEK DEPOSIT MONEY

A. J. FLATLEY LTD., Manchester appliance makers, have adopted an unorthodox method of financing their business. They are advertising widely in the provincial Press for deposits from the public of £25 or over, offering a 10% interest rate for the shortest of terms. A quarter of the deposit is redeemable on demand and the remainder at one month's notice. As an additional attraction, directors say they intend to apply for Stock Exchange quotation of A. J. Flatley shares in July next year, and depositors will be given preference in the event of a public issue.

A new subsidiary, A. J. Flatley (Distributors) Ltd., will accept the deposits and then discount bills receivable for the parent company, so improving its liquid position. No doubt the factory which the company is building at Bantry Bay, Eire, to concentrate on Continental markets is putting a considerable demand on financial resources.

A pamphlet called "Investments Guide," which Flatley distribute to potential depositors, says they have been offering a 10% cash discount to customers in order to obtain a quick return of capital. But the "very tempting discount" necessary to attract quick payment from the large chain-store groups is also referred to and it is believed that this has cost more like 20%.

Two new products are ready for production, the pamphlet discloses. These are a 2 cu ft refrigerator which will retail at under £20 and a sink waste crusher and disposal unit for under £25.

Progress has not been interrupted by the credit squeeze, it is claimed, and an all-time high of £120,000 for a single week's sales has been reached since restrictions began. Directors "confidently expect" to maintain a turnover of £5 million during 1961.

ULTRA BUY TRIX

THE sound amplification business formerly operated by Trix Electrical Co. Ltd. has been acquired by Ultra Electronics Ltd. The assets acquired are a production unit at Maple Pl, London, W.1, where Ultra will continue the manufacture of the Trix range of public address and aircraft intercommunication systems. Because Trix Electrical is in liquidation, the mechanics of the deal involved the formation of Trix Electronics Ltd., which now becomes an Ultra subsidiary. Ultra Electronics is the main operating company of Ultra Electric (Holdings) who shed their radio and TV interests to Thorn earlier this month.

Stella to market Ada

AS from 1 June, Stella Radio and Television Ltd. are sole *concessionaires* in the UK for Ada domestic appliances. Inquiries and correspondence should now be sent to the company at Astra Hse, Shaftesbury Ave, W.C.2. After-sales service arrangements remain unchanged.

'Bait' Sewing Machines

SWITCH-SELLING is still used by some advertisers of sewing machines—according to the latest edition of *Shoppers' Guide*. Anyone who answers advertisements offering "bait" machines at low prices needs to be prepared for a variety of tricks. Of seven electric sewing machines tested, the "Viking" is considered the best in spite of an awkward bobbin. In the electrical and endurance tests, both the "Elna" and "Pfaff" were given black marks, while in some other models the switch caused TV interference.

STEADY GROWTH IN STORAGE HEATING

SALES of thermal storage space heating and hot water storage systems have settled down to a steady rate of around a quarter of a million kW of equipment a year. By the end of December, 1960, 1,300,000 kW were installed in England, Scotland and Wales, the Electricity Council reports, compared with 1,100,000 kW nine months earlier. Floor-warming is the most popular with 600,000 kW installed, followed by 500,000 kW of block heaters and 200,000 kW of hot water storage.

Heating Engineers announce Conference Programme

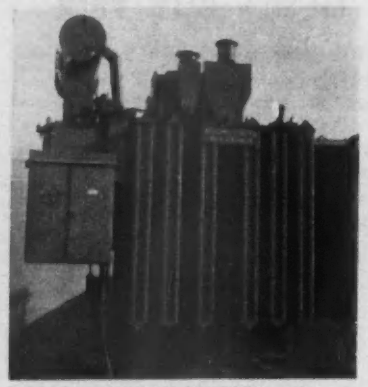
A WIDE ranging programme of technical and administrative subjects has been arranged for the International Conference on Heating Ventilating and Air Conditioning at Olympia from 27 Sept. to 4 Oct. this year. Simultaneous translation into French and German will be provided, if warranted, and distinguished specialists from several continental countries and the US will be among the speakers. Altogether there will be 24 principal papers on three themes—technical advances likely in the next ten years, administrative advances, and integrated design of architectural and engineer services. An exhibition will be held in conjunction with the conference and delegates will be offered a selection of technical visits. In addition there is a well-chosen programme for the ladies of delegates, with such alternatives as fashion shows or days in the countryside.

This is the first international conference under the auspices of the Institution of Heating and Ventilating Engineers. While there have been national conferences in various countries, its only predecessor on an international scale is one staged during the Brussels Exhibition. The event should not be confused with two shows in 1962, the Third International and Air-Conditioning Exhibition from 9 April to 12 April and the International Refrigeration Fair from 13 April to 19 April, details of which we have already reported.

U.S. cuts Uranium Costs

BIG cuts in the price charged for uranium by the US Atomic Energy Commission are to apply from 1 July, say reports from America. Prices for enriched uranium will be reduced by between 20 and 34%, depending on the proportion of U235, the fissile isotope. There are to be cuts as well in the price of depleted uranium, left after processing to obtain enriched uranium. The reductions are made possible by the fall in the cost of natural uranium. The reductions in price will apply both to nuclear fuel for reactors operating in the US and also to foreign reactors using American fuel. It seems probable that the reductions are greatest for uranium having the smallest enrichments from the natural U235 content.

Grouping of 76 AEI specular and diffuser reflector floodlights holding 1,000 W g.l.s. lamps on eight 60 ft Tubewright towers provide illumination for round-the-clock handling of bulk fuel at Kincardine station. Electrical contractors were James Kilpatrick



One of several 10 MVA, 22/6·6 kV transformers, with 3 kV tertiary or stabilised windings, recently completed by Aberdare Electric Africa Ltd.—a subsidiary of South Wales Switchgear Ltd.—for the municipality of Port Elizabeth. They are claimed to be the largest transformers so far built in Africa

ORDER BOOKS LONGER STILL

THE order books of engineering and electrical engineering firms are going from strength to strength. Orders received in March were 17% higher than in March, 1960, with the CEGB's order for four 500 MW sets for an as yet unnamed station making no mean contribution. Export orders, however, failed to keep pace, trailing 3% behind the intake of the previous March.

Taking the first quarter of 1961 as a whole, new orders were 6% higher than in the previous corresponding period, a major advance when it is considered that the influx of orders in the first quarter of 1960 was considered particularly high. Production also is rising, and is estimated to be 3% higher for the quarter than the volume of a year earlier.

INCREASED ALLOWANCES FOR SUPPLY PERSONNEL

IMPROVED lodging and subsistence allowances and removal expenses for employees in the electricity supply industry took effect this month. They result from agreements reached by the National Joint Board and the National Joint Council for the industry. The settling-in grant, for instance, goes up to £120 if a man on NJB scale 13 and over, or on NJC grades 9 and above, is moving into a house. For those on lower grades the grant becomes £100. Lodging allowances are correspondingly raised to a maximum of £5 15s/week and £5 5s/week, respectively, for married employees, and £2 17s 6d and £2 12s 6d for single employees.

OFFICIAL PUBLICATIONS

DSIR. Report of Research Council, 1960. HMSO. 4s (see this page).

ERA Publication:

F/T195, Basis for short-circuit ratings for paper-insulated lead-sheathed cables up to 11 kV (Copper conductors: unscreened), L. Gosland and R. G. Parr. 24s.

MORE MONEY ON RESEARCH

A FURTHER £2 million was spent on research last year by the Department of Scientific and Industrial Research, making £12·2 millions for 1960-61. This increasing rate of expenditure has led to an important change in administration to give greater financial flexibility than the former five-year plans. In future, expenditure for the following year will be agreed with the Treasury and reasonably firm estimates given for the next two years, with less definite forecasts for the fourth and fifth years.

The number of research studentships awarded is increasing and for electrical engineering rose from 50 in 1958 to 77 in 1960. An experiment in making such awards to lower second class honours graduates is being tried but awards will be terminated after one year in cases where a lack of research ability is shown.

A new word is introduced in the renaming of the Control Mechanisms and Electronics Division of the NPL; from April it is to be known as the Autonomics Division. This signifies a change in its activities; it is now moving towards the development of "trial and error" machines that can discover for themselves how to control, recognise and translate. The translation of Russian scientific documents is one such project. Work is continuing on the automatic correction of errors in machine tools and the Government Chemist is undertaking a full-scale study of pollution by radioisotopes. Samples of river water and effluents are being studied, particularly those associated with nuclear establishments.

Railways choose central cabins

A CENTRAL driving cabin suitable for one-man operation has been chosen by British Railways for 88 diesel-electric locomotives which Clayton Equipment Co. are to build for Scottish Region (we reported last month that GEC are to make the electrical equipment). As yet the National Union of Railwaymen insists on the use of a fireman as well as the driver, but BR apparently hope to alter this.

The 900 h.p. of the locomotives fits them mainly for short-distance freight or local passenger trains, and 20 will be equipped with oil-fired boilers for steam heating carriages. It is not yet known in which localities the locomotives will be used for passenger traffic, but it will not be Glasgow.

Hampshire C.C. oppose Station for Calshot

HAMPSHIRE County Council have decided to oppose the proposal to build a 2,000 MW steam power station at Calshot on Southampton Water. The proposal is the CEGB's alternative now that the plan for a nuclear station at Hamsted, IoW, has been shelved. New Forest RDC objected to the Calshot plan earlier this year, but the County Council declined to take sides until more information was available.

Since then the Council's planning committee has recommended that the plan be "strongly opposed" and this was endorsed by the full Council after an hour's debate at Winchester this week. Sir Richard Calthorpe, chairman, said: "It is simply a case of industry or green belt—and we prefer the latter."

Expanding Network in Somerset

SOUTH WESTERN EB are investing nearly £1,100,000 this year to improve their distribution in Somerset, Mr A. N. Irens, chairman, said at the Mayor of Taunton's banquet last week. Last year 250 miles of mains and 500 new substations in the Somerset group of districts cost over £1 million. In Taunton alone last year, 2,000 new consumers were connected, including 900 rural properties.

"The House of the Shires"

This modern kitchen is a feature of an all-electric house erected by George Calverley and Sons, Leicester, which includes floor-warming, thermostatically controlled oil-filled radiators and a 6 kW immersion heater for water heating. Named the "House of the Shires," it is on view for the whole of this month

HIGHLANDS NEED AID, NOT INQUIRY

STRONG criticism of the decision to set up a committee of inquiry into power generation and supply in Scotland was expressed by Mr John M. Rollo, chairman of the Highland Fund, in Glasgow last Thursday. He considered that the Highlands today stood in greater economic danger than at any time since the Clearances. The setting up of the committee of inquiry had stopped work on all new hydro schemes. He estimated that the shelving of the Glen Nevis scheme alone would mean the loss of at least £1 million in wages in the coming year in the Highlands. It could be that in a year's time the North of Scotland Hydro-Electric Board might be replaced by a Westminster body with no more knowledge of Highland matters than the man in the moon, he went on. Much was heard today of an upsurge in the Highlands, but frankly he could not see it. In the past year the diatomite workings had closed, a knitwear factory in Tobermory had ceased operations, and now the Brora colliery had closed down. Mr Rollo pointed out that Mr Hugh Fraser, Parliamentary Under-Secretary of State, Colonial office, had just announced massive injections of financial help to Kenya to revive the economy and help deal with unemployment. "Is it necessary to have Mau Mau in the Highlands before we can obtain money to repair the devastation of the past 200 years?" Mr Rollo asked. Meanwhile, there is indication that many local authorities are rallying to the support of the Hydro Board. Inverness County Council, who are to submit evidence to the Departmental Committee, agreed to call a meeting of representatives of all the Highland local authorities to consider the situation as it affects the Hydro Board. Inverness CC have already condemned any attempt to alter the Board's independent status.

Heat Flow Between Metals in Contact

FACTORS which affect the flow of heat between machined metal surfaces in contact have been investigated by the National Engineering Laboratory. A recent report from the Laboratory (NEL Report Heat 182) gives the results of experiments made with brass and aluminium surfaces, of four different values of roughness, in contact with steel and brass surfaces at contact pressures going as high as 11,400 lb/sq in.

The report shows that most of the heat is transferred by surface contact and conduction through an intervening fluid. The effective thickness of the fluid film from the heat conduction point of view varied with surface roughness. Factors affecting conductance through the surface contact include applied pressure, surface hardness, surface finish and thermal conductivities of solids. The work has led to a theoretical expression giving surface contact conductance.

Amongst fields of engineering where this work may be of importance is nuclear energy, in relation to the contact between the fuel rod and its encasing metal can.

Nuclear Energy Competitive by 1970, says Euratom

NUCLEAR energy will become competitive with other sources of energy before 1970, estimates the Euratom Commission in its fourth general report, published last week. That forecast is the basis of the Euratom work during 1960-61, which has involved research into potentially cheap reactor types.

Altogether, nuclear power stations being built or planned should provide 1,565 MW by the end of 1965. Further projects for Germany (two 150 MW stations), Italy (160 MW) and the Netherlands are under discussion. The Euratom Commission has a scheme for contributing to the extra costs of nuclear as compared with conventional stations over the next few years.

Euratom countries are contributing to a number of studies of nuclear ship propulsion, and 40% of the cost of a German company's draft design for a nuclear tanker is being met.

Enfield and Delta merge copper rolling

ENFIELD Rolling Mills and the Delta Metal Co. are to merge their rolled copper and brass sheet and strip interests from the end of this month. Object of the move is to improve productive facilities, but production will continue at Enfield's Brimsdown works and Delta's works at Birmingham. A new company, Delta Enfield Rolled Metals, is being formed to carry on the combined operations, with the share capital equally divided between the two principal companies. The other activities of the principals are unaffected by the deal.

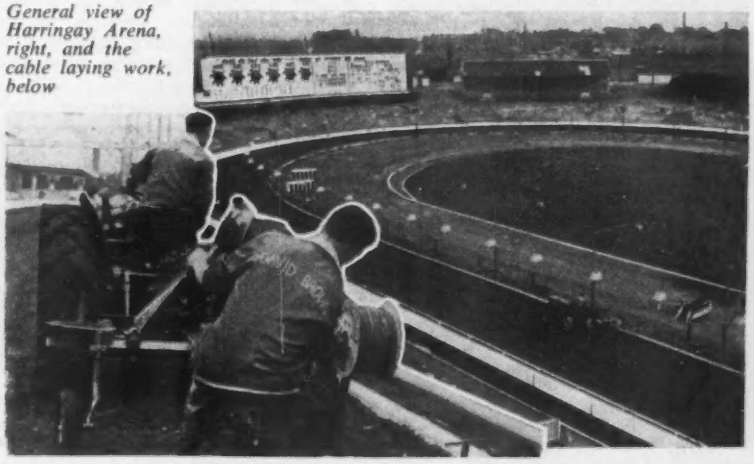
Travelling Exhibition Award Offer

THE management committee of the Caroline Haslett Memorial Trust (Electrical Section) is inviting applications from women with considerable experience in the electrical industry for consideration in awarding the seventeenth Travelling Exhibition. The winner will study various aspects of domestic electrification, probably in Europe or the Middle East. Value of the exhibition and the duration of the tour will depend on the country finally selected by the committee. Application forms, to be returned by 12 July, are obtainable from the Trust at 25 Foubert's Pl, W.1.

TURF HEATING FOR GREYHOUND TRACKS

HARRINGAY is one of three of the Greyhound Racing Association's eight tracks which are getting more certain protection against frost. Instead of the old straw method, electric heating cable is to be used. A start has been made on the scheme at Harringay, and at Belle Vue, Manchester, and a similar installation will be laid at White City next year. The system is similar to that utilised at Murrayfield, headquarters of the Scottish Rugby Union, in September, 1952. GEC are supplying the stranded tin steel wire, which is encased in a tough, high resistant, p.v.c. sheath. There are 36 lengths of some 1,560 ft each, laid 5 in. deep at 6 in. spacings. Total loading is 270 kW, and running cost will be about £1 an hour. Thermostatic control switches on the system when the temperature drops below 32°F. In laying the cable, the David Brown tractor/cable laying machine is being used. This cuts a narrow vertical slit to the correct depth, into which the cable is fed, and subsequent rolling completes the process.

General view of Harringay Arena, right, and the cable laying work, below



Cromptonians' Dinner

Sir Hamish MacLaren, IEE president, speaking at the annual dinner of the Cromptonian Association last Friday, which was attended by nearly 240 people. Other speakers were Mr H. H. Spencer (Rustyfa), president of the Association, Mr C. F. Dickson (joint vice-chairman, Crompton Parkinson), and Lt-Col R. P. Tong (chairman of governors, Mid-Essex Technical College)

LARGE ORDERS

CONTRACTS for general wiring and special cables, worth over £1¼ million have been received from various area electricity boards by Wandleside Cable Wks Ltd. and its associate, Irish Cables Ltd. They have also received orders from several regions of British Railways totalling £600,000.

A NEW 132 kV line, 6¼ miles long, to link a 132/33 kV substation to be built at Blyton, ten miles south of Scunthorpe, is to be built by AEI Construction (Cables and Lines) Division Ltd. The line will connect with the existing Keadby-Wold Newton 132 kV line near Messingham. The line is to be completed next summer.

A MECHANISED ash-handling plant is to replace the old monorail bucket system at Kearsley power station of the CEGB. Bennis Combustion Ltd. have been given the order, worth over £66,000, for a system comprising 25 belt conveyors of which eight are of the submerged type for quenching the hot ash. The system, capacity 56 tons/hr, will be automatically controlled.

FOUR 20-ton overhead cranes for the Dungeness nuclear power station have been ordered from Matterson Ltd. They are for use as blower house cranes and are due for delivery early in 1962. That company is also to supply two 25-ton Goliath cranes for Thorpe Marsh power station.

Price Maintenance "Costs £180m. Yearly"

MR RALPH HARRIS, director of the Institute of Economic Affairs, will argue next week that the abolition of resale price maintenance would save customers £180 million a year by raising efficiency. He will be speaking at a public debate at Birmingham University at 2.30 p.m. on Wednesday on the subject "Should Resale Price Maintenance Be Abolished?" Taking up the cudgels in favour of price maintenance will be Mr Frank Friday, an economist with EMI and honorary economic adviser of the resale price maintenance co-ordinating committee. Mr Friday contends that price maintenance helps manufacturers' planning, reduces short-term fluctuations in demand, protects the independent shop, and that abolition in other countries has not caused price reductions.

Site Shotblasting

SITE shotblasting using mobile equipment is now being offered on a contract basis by the Birmingham firm, R. J. Richardson and Sons Ltd. Two trucks with trailers take the equipment to site, one of the trailers carrying a 90 kVA diesel generator for operating driers, recovery plant and dust-suppression units. Although the work is mainly concerned with preparation for painting of large pipelines and bridge structures, the plant has also been used for site shotblasting of reactor pressure vessels and turbine rotors. With correct selection of air pressure and shotblasting medium it is possible to prepare surfaces other than steel on site.

Emergency Supplies at Trawsfynydd

ALL the stationary batteries, together with mercury arc and selenium rectifier battery-charging equipment, for Trawsfynydd nuclear power station have been ordered from Pritchett and Gold and EPS Co. Ltd. Each of the two reactors will have a standby 2,880 Ah battery capable of supplying a load of 520 kW at a nominal 420 V for 20 min. Their duty will be to supply power to keep the essential services in operation during the 20 min. available for bringing into commission standby diesel generators.

Emergency lighting requirements will be provided by the 240 V, 2,000 Ah battery, which can provide 175 kW for periods of up to two hours, including supplies for the turbine auxiliaries, emergency lighting and h.v. circuit-breaker solenoid closing. For switch-closing and tripping duties, together with indication loading of 6 kW for three hours, one 110 V, 250 Ah battery is being supplied. The company are also supplying Hackbridge and Hewittic mercury arc rectifiers for charging the batteries for reactor essential services and station main battery, and Westinghouse selenium rectifier charging equipments for the 110 V switchgear operating battery.

GOLDEN JUBILEE

THE Macfarlane Engineering Co. Ltd. celebrated their fiftieth birthday last Thursday by completing their 50,000th machine. One of its founders, Mr James C. Macfarlane, the chairman, is still active in the day-to-day management of the company. Outlining the firm's history at a luncheon to celebrate the occasion, Dr James W. Macfarlane, managing director, referred to three occasions when the company had led the world in electrical engineering. It claimed to be the first to manufacture, in quantity, a commercial welding generator (in 1919). In 1942 it patented the Magnicon, a self-regulating alternator (many of which were subsequently made by other firms under licence) and for which the company received a patent award of £125,000, tax free. The third claim was for the introduction in 1959 of the world's first commercial brushless alternator.

For the first time in 13 years, the chief commercial officers of the electricity boards of England and Wales held their quarterly conference in Scotland when they visited Pitlochry last month. With the officers were representatives of the Electricity Council, CEGB, S Scotland EB and N of Scotland HEB. The party are here seen at Perth

ODD-JOB WIRING LEADS TO LAWSUIT

A CAFE proprietor who complained that wiring carried out by an odd-job man was faulty, still had to pay for it as a result of a decision in Plymouth County Court recently. But he succeeded in a counter-claim for putting the defects right. In evidence, Mrs Harvey, wife of the proprietor of Jennycliffe café, said customers from a nearby caravan site had complained of shocks from handrails and taps after Mr T. W. Weaving had put in the wiring. The judge said people who wanted jobs done cheaply often ran risks, and awarded £29 16s 3d with costs to Mr Weaving against Mr J. Harvey, as well as £7 10s with costs to Mr Harvey against Mr Weaving. Mr Weaving is not a member of ECA.

Board to recruit boys for non-craft jobs

EASTERN EB have decided to train school-leaving boys as meter readers, storekeepers, craftsmen's mates and for other manual jobs. By the orderly recruitment of juniors they hope to overcome the problems of the high turnover among adult workers in these jobs and the shortage of suitable people in some areas. The boys will be called "operative trainees" and no particular educational level will be required.

Traders Complain about N.A.A.F.I. Discounts

NAAFI are selling more refrigerators, washing machines and other appliances now that the armed forces are concentrating on career personnel, and this has brought complaints from retailers in S.E. Hampshire. Chambers of Commerce in the area have decided to ask the National Chamber of Trade to examine the possibility of curtailing some of Naafi's discounts. Naafi charge the full fixed price on appliances, but Forces personnel receive a quarterly dividend of 5% on the value of their purchases.

Sayings OF THE WEEK

"Of 139 graduates in the electrical industry interviewed in the past two years only two were using what they had learnt in their university training, and all were having to study subjects which included economics, statistics and social psychology in order to do their jobs." . . . DR D. CHAPMAN (Liverpool University), at Central Council of Association of University Teachers' meeting.

"It is essential that there should be thorough communication from the boardroom to the shop floor." . . . SIR JOSIAH ECCLES, deputy chairman, Electricity Council, at British Institute of Management conference.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, May 30

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	244	−4½
" (3 months)	245½	−3
LEAD, refined pig, 99·97% purity (cash)	65½	−1½
" (3 months)	66½	−1½
TIN, refined, min. 99·75% purity (settlement)	873	+3
(3 months)	878	+4½
ALUMINIUM, ingots 99·99·5%	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	210½	−1½
SILVER (Troy oz)	79½d	−¼d

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	82½	−½
" (3 months)	82½	−½
RUBBER, per lb. No. 1, RSS, spot	26½d	—
c.i.f. basis, ports, July	25½d	+½d
ARMOURING: Galv. Steel Wire (0·104 in.)	67½	—
Mild Steel Tape (0·04 in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	67	—
AMERICAN PRICES: Copper, electrolytic (per lb)	31c	—
Lead, (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

FOREIGN COMPETITORS ENTER NIGERIAN MARKET

NIGERIA'S independence has put an end to Britain's virtual monopoly of the appliance market. With the elimination of import restrictions, UK's share has slipped to 65%. The US have made the greatest impact, mainly on account of their large refrigerators, but Continental manufacturers have also gained a small foothold and Japanese portable appliances are making an appearance.

At present there are only about 70,000 electricity consumers out of 37,000,000 inhabitants, and appliance turnover amounts to £1 million a year. Refrigerators account for £560,000 of this, and cookers and water heaters some £100,000 of the remainder. The principal customer is the Government, which still purchases in bulk through a Crown Agent. Next in importance are the large commercial firms who, like the Government, provide housing already fitted with the major appliances for their employees. A survey by the Trade Commissioner appearing in the Export Service Bulletin says there is now TV advertising in Nigeria, but does not mention the market for TV receivers. The number of towns with an electricity supply is growing rapidly and 230 V 50 cycles is standard everywhere.

Cordless P.A.B.X. for blind operators

WITH the aim of perpetuating the employment of blind telephonists, Standard Telephones and Cables Ltd. have designed, in conjunction with the Royal National Institute of the Blind, a special switchboard for the cordless private automatic branch telephone exchange, which may be operated by blind or sighted operators. Of compact design, it can be mounted on any convenient desk or table. The board has lamps, keys and push-buttons for use by an operator with normal sight, but special plungers give a blind operator fingertip indications of the state and progress of all calls.

News in Brief

The Electricity Council has a stand at the national exhibition of apprentice opportunities which is being staged at the Royal Exchange, London, as part of Commonwealth Technical Training Week.

Eastern EB have opened a new showroom at Sudbury, Suffolk, replacing premises burnt out a year ago.

Annual general meeting of the Association of Managerial Electrical Executives will be held on 14 June at 5 p.m. at the lecture hall, Winter Gardens, Devonshire Pk, Eastbourne.

Seeboard have plans to erect office and stores at Ridgeway Rd, Dorking.

Some 30 members of the ASEE, attending the Association's annual conference, visited the research laboratories and training school of Allen West and Co. Ltd.

Partridge Wilson and Co. have fitted out the motor yacht *Pericles* as an exhibition of their products. After the BEPC, it is to visit Scandinavia, Finland and the USSR.

Annual fête of the Royal Commercial Travellers' Schools will be held in the school grounds at Hatch End on 17 June.

Floor-warming has been installed in the new grandstand for 13,000 people at Ascot racecourse.

Mitchell Construction Co. have been awarded a contract for the superstructure of the Inverawe power station by the North of Scotland H-E Board.

This year's management committee of BREMA's Audio Group includes for the first time Decca, Easco, Philips and STC.

Dimplex Ltd. have just dispatched 5,000 infra-red heaters to their Australian agents.

Initially visiting the country's agricultural shows is a new mobile demonstration showroom of Kenwood Manufacturing (Woking) Ltd.

The aircraft equipment division of English Electric has been awarded a £500,000 contract for hydraulic constant-speed generator drives and associated equipment for Vickers VC 10 airliners.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Tidal Plan Shelved?

The Canadian Government has virtually shelved plans for the proposed Passamaquoddy tidal power scheme, although officially it has been said that "close attention" will be given to the report of the International Joint Commission submitted some time ago. That Commission agreed that the project was feasible in the engineering sense, and could be built with little harmful effect on fisheries, but they emphasised that at present it would not be economic. As a result, the New Brunswick Electric Power Commission has suggested that full development of power sites on the St. John River should be undertaken. Potential of the St. John is estimated at 1¼ million h.p. of which one million h.p. is on the New Brunswick side of the river which has its source in Maine.

Future Pumped-storage?

With a view to a possible future pumped-storage hydro-electric project, the Hydro-Electric Power Commission of Ontario has taken options on 900 acres near Delphi Point, on Georgian Bay, we understand. Commission engineers are to carry out extensive soil tests and investigations to determine the suitability of the area. About 600 acres of the optioned land are on Collingwood Mountain, the remainder being in a wide strip extending to the shore—a distance of about one mile. It is suggested that water could be pumped up the mountain at Delphi Point to fill a storage basin about 800 ft above lake level. The investigations are part of the Commission's long-term power development programme, and it is now expected that an early start would be made on the project. But if the site proves suitable, the Commission propose to purchase the land immediately to avoid disruption to future commercial and residential developments which might take place.

BRITISH GUIANA

Rural Plans

It is the intention of the British Guiana Government that the newly formed British Guiana Electricity Corporation should have the exclusive rights of electricity distribution throughout the country, Mrs J. Jagan, Minister of Labour, Health and Housing, stated last month. She was answering a question on how soon the Government proposed to introduce rural electrification. This work was beyond the present capacity of the Corporation, she pointed out, but it was expected that additional capacity would be installed by the end of next year. Improvements to the distribution system should also be completed about the same time, after which the Corporation was expected to give its attention to supplying potential consumers within its franchise areas, particularly on the east coast of Demerara. It was anticipated that when the new generating plant had been installed at the power station, some of the diesel equipment recently installed could be transferred to other sites as part of the rural electrification plan.

W. INDIES

Increased Expenditure

The five-year allocation for electricity development in Trinidad and Tobago has been increased from $33·9 million to $55·8 million. A large part of the increase arises from anticipated expenditure during 1961 and 1962 on the installation of two 50 MW generating sets at Port-of-Spain power station. The programme is being financed by a World Bank loan, as we earlier reported. The official handing over of the Port-of-Spain municipal undertaking to the Trinidad and Tobago Electricity Commission took place a few weeks ago.

CYPRUS

Loan News

Britain has offered to contribute towards the £7½ million electricity development scheme of the Cyprus Government. This follows the recent visit to London of the Cyprus Finance Minister. But the actual amount and terms of the loan have not yet been agreed, it is understood. There are reports that Britain has offered a loan at 6% interest, whereas the Cyprus Government had 4% in mind.

S. AFRICA

Railway Production

The first all-steel electric train to be built in South Africa has been handed to the general manager of the South African Railways. The train consisted of two electric units and six suburban passenger coaches, one of which was equipped with a driving cabin. After the addition of certain imported technical units, the train was in the main an all-South African effort. In all, 56 electric train sets are to be built in the Nigel factory of Union Carriage and Wagon Co. (Pty.) Ltd., each consisting of two electric units and six passenger coaches. The total value of the contract placed with Union Carriage and Wagon is about £9,500,000. Since March the sets have been reaching the South African Railways at the rate of two a month. It is planned to use them on the Witwatersrand suburban electrified system and on the similar system in the Western Cape. South African Railway engineers report that these all-steel coaches are in every respect comparable with similar units made overseas for the administration in the past.

£8 million Loan

The new £8 million loan recently floated by the Electricity Supply Commission of South Africa was subscribed within a short period. Interest is at 5⅞% and the issue price £100%. The loan will mature in 1981-86. The purpose of the loan is for further expenditure on the construction of Highveld, Komati and Ingagane power stations, on extensions to the Hex River power station and on extensions to the transmission and distribution systems of the Cape Western, Eastern Transvaal, Witwatersrand and Orange Free State and other undertakings for supplies to various consumers.

INDIA

New Branch

A special branch is to be set up in India's Central Water and Power Commission to undertake the work of engineering, design, procurement and installation of large thermal and hydro power stations. It is expected that the organisation will take about three years to build up to the position of carrying out the actual work, but the senior posts of director, chief engineer and deputy chief engineer are to be filled next year. Some officers will probably be sent abroad for specialised training. The move is intended to save foreign exchange, for at present India employs foreign consultants for her large power projects.

Transformer Production

First output of switchgear and transformers from India's heavy electrical project at Bhopal is expected later this month, some ten months after the plant went into operation. The manufacturing programme for 1962-63 includes 45 power transformers, 32 transformers for traction, and 460 welding transformers, among other items, the managing director, Mr S. Saranpani, has announced. But he admitted that there was some initial difficulty in selling goods produced by the factory as most of the State electricity boards were still buying from abroad. The Central Water and Power Commission had been approached in this regard. Steps would be taken to export the products of the plant. The plant was not competing with the private sector, he emphasised. For output valued at Rs50 crore, raw materials, mostly imported, accounted for Rs30 crore. Steps were being taken to encourage Indian industrialists to produce these raw materials he added.

PAKISTAN

H.E. Scheme Transfer

Construction of the Kalam dam multi-purpose project, some 60 miles north east of Saidu Sharif, is to be taken over by the West Pakistan Water and Power Development Authority. The latter are to undertake a detailed survey of the dam site. Estimated to cost Rs4·5 crore, the project will have an output of 40 MW, and irrigating 150,000 acres of land.

AUSTRALIA

Next Snowy Project

The Australian National Development Minister, Senator Spooner, has stated that the second major section of the Snowy Mountains hydro-electric project will start soon. The diversion of the Eucumbene, the upper Murrumbidgee and the Tooma Rivers to the Tumut River had been completed and the next stage would be the Snowy-Murray development, for the diversion of Snowy waters to the Murray Valley. The Snowy Mountains Hydro-Electric Authority are now seeking tenders for a 15-mile tunnel to divert Snowy River waters from Island Bend to Lake Eucumbene.

Saving Coal Industry

Concerned at the future of the state's coal mining industry, the Government of Tasmania is seeking information on utilising such fuel in various ways. The immediate idea was for a thermal power station, but the Premier, Mr Reece, has said that on the information at present available it does not indicate that such a plant would solve the problem for the coal industry in the state without making another increase to the cost of electricity. "It is obvious that such a move would not be desirable, and some other solution may have to be sought if another assessment of thermal power costs substantiate our own calculations," said Mr Reece. "The coal industry in Tasmania could be saved if it was not necessary to charge the cost of building the plant and the interest on that amount against the income derived from electricity sales. There is no way in which this can be arranged by the State Government without producing some form of adverse financial result, but it could be done if the Commonwealth Government would make a grant of the cost of building a thermal station, and then leave the operation and maintenance of the plant to the Hydro-Electric Commission. Only on this basis would it seem that the proposal would reach the region of costs equivalent to those of hydro-electric schemes. I intend asking the Commonwealth to give consideration to making such a grant as a means of stabilising Tasmania's coal mining industry," the Premier said. He also indicated that the Hydro-Electric Commission arranged for the New South Wales Electricity Authority to make an economic assessment of thermal power production in the Fingal Valley region of Tasmania, the area concerned.

£30,000 DEFICIT—TARIFFS UP 18% IN UGANDA

COINCIDENTAL with news of a deficit of £30,982 for operations in 1960, the Uganda Electricity Board has announced an 18% increase in tariffs. The latter is designed to provide the additional revenue required by the World Bank as one of its conditions in granting the £3 million loan to the Board (to which we referred on 13 April). With the approval of the loan by Uganda's Legislative Council, tenders will be invited this month for the projects covered by the loan, including extensions to Gulu, Lira, Hoima, Masindi and Fort Portal. A scheme for Kabale and various reinforcements and new spur lines are also to be financed by the loan, which will meet the Board's expenditure up to about the middle of 1964. From that date the Board should be able to finance any additional expenditure from its own resources.

The Board did consider the possibility of supplying Arua and Moroto from local diesel stations, but as these would involve a loss the World Bank refused to advance the necessary finance and these two projects are being deferred.

The deficit of £30,982 from operations by the Board in the year ended 31 Dec. last, was more than had been anticipated, and compared with a surplus of £9,745 for the previous year. Yet it is considered that the current year will be even more difficult from the financial point of view.

The Board, in fact, is beset by a number of difficulties at the present time. First, additional unit sales are now mostly confined to Africans, whose consumption is a small fraction of the average consumption by Europeans and Asians. (At the end of December there were about 6,000 Africans among the 30,037 consumers connected.) This situation is likely to continue unless African consumers can be attracted at a much faster rate than at present, or until wages and the standard of living rise so as to lead to a higher average consumption.

As one move towards the latter the Board has been recommended to widen its hire-purchase scheme to include the smaller electrical appliances—at present this applies only to the larger appliances.

Total unit sales to Uganda consumers amounted to 202·4 million units, an increase of 9·2%, of which large industrial consumers accounted for 91·1 million (10·7% increase), small industrial users for 43·5 million (8·2% increase), and domestic consumers for 41 million units (0·5% increase), it is stated in the annual report.

Over the past five years, the Board has given close attention to the electrification of ginneries and coffee factories, of course, but the number of these still to be connected is now rapidly diminishing. A backbone of main distribution lines has already been established, and now the problem is to extend supply as far as is economically practicable. Cheaper construction and simplified service connections are being utilised, along with joint use of poles with the Posts and Telecommunications Administration. For service connections the Board is experimenting with concentric cable with p.v.c. insulation which it is expected will reduce both costs and the risk of accidents. The services will be terminated on the wall outside the premises, for easier meter reading and improving protection by eliminating lead-in mains.

Altogether, the Board spent £587,448 on new development schemes last year. Apart from the difficulty in obtaining capital the Board has a major problem in attracting skilled staff in view of the political and economic situation in the Protectorate. A considerable number of the expatriate personnel, mainly recruited from the UK, are returning to Britain. To offset this trend, the Board has initiated fixed period contracts at higher salaries, while stepping up its own training scheme.

Station Operation

Installed capacity of Owen Falls hydro-electric station remained at 120 MW but the foundations and installation of embedded parts for the tenth and last generating set were completed. Two additional 20 MVA interbus transformers were commissioned to improve load transfer between the 33 kV and 132 kV busbars. The station provided 99·25% of the total units generated during the year, the remainder being supplied by diesel plant. The new 460 kW set at the Kikagati hydro-electric scheme on the Kagera River, is expected to go into operation very shortly.

Bulk supplies to Kenya increased by 23·7% to over 160 million units during the year, and further discussions took place between the Board, the Kenya authorities and the Colonial Office, with regard to the next major hydro-electric development in East Africa and the transfer of power between the two territories.

The main 132 kV transmission system again performed satisfactorily, only one circuit of the Owen Falls/Tororo line being affected. The fault incidence on this line is 1·9/100 miles per annum—well below the predicted figure of 5/100 miles for lightning alone. But an unusually large number of faults occurred on small rural distribution transformers as a result of lightning, and extra expenditure on surge protection in some cases has been decided upon.

Company Activities

HOLIDAY influences are now beginning to exert their traditional braking influences on the stock market although there is little doubt that the undertone remains remarkably firm. Business in the post-Whitsun week might have been expected to have responded more positively to the news that new orders in engineering and electrical engineering were 17% more in March compared with March, 1960, but in the event business was inclined to shrug off the glad tidings as if already anticipated. More activity may develop later both as a direct and indirect result of the man-on-the-moon. President Kennedy's call to spend an extra £2,500 million to £3,214 million over the next five years on space exploration with the prime object of putting a man on the moon before the Russians will do much to take up slack in the US economy. In fact, he has already told Congress: "The recession has been halted. Recovery is under way." Wall Street is only a step from its all time high and buoyant business in the US will proliferate itself throughout the markets and industries of the "free world." It is upon considerations such as these that London will continue to find firm props for its own prosperity and the level of stock market prices.

Electrical shares last week, however, were inclined to retreat over a broad front although losses were small enough. There were very few items of electrical company news for the market to bite upon and where these were forthcoming prices moved irregularly.

Back on the down-path, Ultra Electric (Holdings), which had previously recovered well from the news of its sell-out of radio and TV interests to Thorn, slipped once more from 30s 9d to 27s 9d on news that it had bought for itself the shares of Trix Electronics of London for £42,000. Ultra has announced that Trix will continue to make and install sound amplification equipment.

By way of contrast, British Thermostat reported a group net profit after tax of £512,632 against £396,581 in the previous year and a dividend and bonus of 1s 4½d a share against 1s a share dividend last year. Chairman, Mr J. Sherlock therefore saw his 5s Ordinary shares up 2s a time to 40s 3d on the results.

Then, at the other multi-million end of the electric scale the £1 Ordinary shares of International Computers and Tabulators dropped back from 104s to 99s 3d on the reported placing by Vickers of some 1·5 million ICT shares with City institutions at a price believed to be around 95s. This reduces the Vickers stake in ICT from 38% to around 26%. Vickers themselves closed 6d dearer over the week at 38s for each £1 Ordinary share.—*From our City Correspondent.*

Allen West

A one-for-ten rights issue is to be made to shareholders as at 31 May at a price to be determined. Details will be anounced at the a.g.m. on 21 June.

BICC

Allotment has been made of 54,000 new issue shares not taken up by shareholders. Applications up to 15 shares were allotted in full and a ballot was held for the remainder, with successful applicants receiving 20 shares. The bid for outside shareholdings in Thomas Bolton has succeeded.

Edwards High Vacuum

The group is expanding considerably both at home and overseas and further finance required is to be obtained by a rights issue of ordinary shares, details of which are expected in July. Reporting a good start to this year Lord Wilmot, chairman, said both deliveries and orders for the first four months are higher than in the previous corresponding period. The Instrument Division has completed new premises of 5,000 sq ft on a new three-acre site at Eastbourne, to be extended by a further 10,000 sq ft of production area later this year.

Elliott-Automation

The group's interest in La Thermostatique, France, has been increased from 67% to 75%.

Harland Engineering Co.

A particularly strong order book is a good sign for the current year, and while experiencing the general pressure on margins, the company is expansion-minded. Directors are now considering a further "major extension" to production facilities in order to provide space for the very onerous test demands of clients, and it is also proposed to construct a new laboratory. Sales last year fell 15% to £2,780,000, which the chairman says was partly due to the predominance of tailor-made work at Alloa; but the order intake, at £4,186,000 was nearly double the 1959 level, and orders on hand of £4,923,000 represent 18 months' work.

Year to 31 Dec.	Trading Profit £	Net Profit £	% on Ord.		Ord. Price	
			Earned	Paid	High	Low
1956	249,701	77,395	30·6	12	15/-	8/3
1957	298,860	90,915	36·5	14	10/6	7/1
1958	334,541	100,264	38·3	14	11/1	6/10
1959	435,001	171,221	44·6	16*	14/-	6/11
1960	359,525	127,557	33·2	16	16/3	13/-

* On capital increased by a one-for-two scrip issue.

Laurence, Scott and Electromotors

Increased costs and reduced margins are the hard facts that cannot be avoided, the chairman, Mr G. H. Wilson, told the annual meeting. Last year's lower profit was the result of the prevailing competition, even though there was a slight increase in output. This year output has got off to a "much better" start than last, and the outcome depends on the contest between increasing costs and increasing output.

Philips of Eindhoven

Although TV sales have fallen short of schedule in several countries, worldwide sales of all products in the three months to 31 March, at £106·9 million, were £2·8 million higher than in the previous corresponding period. However, trading profit slipped from 18·4% to 15·8% of turnover.

Reliance-Clifton Cables

Dividend is 5% higher at 20%. In addition there is a tax-free distribution of 7½% from capital profits, compared with 5% in the previous year. Preliminary figures show trading profit up from £453,682 to £541,080 for 1960. After higher tax of £237,430 (*£195,402*) net profit is £238,462 (*£205,641*).

Simon Engineering Ltd.

Following the merger in mid-1960 of Simon-Carves Ltd. and Henry Simon (Holdings) Ltd., Simon Engineering becomes the holding company for these two groups as well as a number of newly purchased subsidiaries. As a result, direct comparison of earnings with the previous year is difficult, but in the first report and accounts, Mr R. B. Potter, chairman, describes a pre-tax profit of £2,814,000 on turnover of £41 million as "satisfactory" and in line with forecasts in the merger documents. At the same time he emphasises that the nature of the company's business makes it impossible to relate the year's profits to the actual work done. Perhaps the best guide to the board's view of the situation is the dividend; this is equivalent to 41¼% when compared with the 35% paid by both of the merged companies for 1959. Actual payout is 27½% for the year, against a forecast 26¼%. Mr Potter says he has every confidence in the continued success of the group. Most departments have increased order books.

B. S. and W. Whiteley

Group net profit is £158,146 (*£154,611*) and dividend raised to 25% with 15% final.

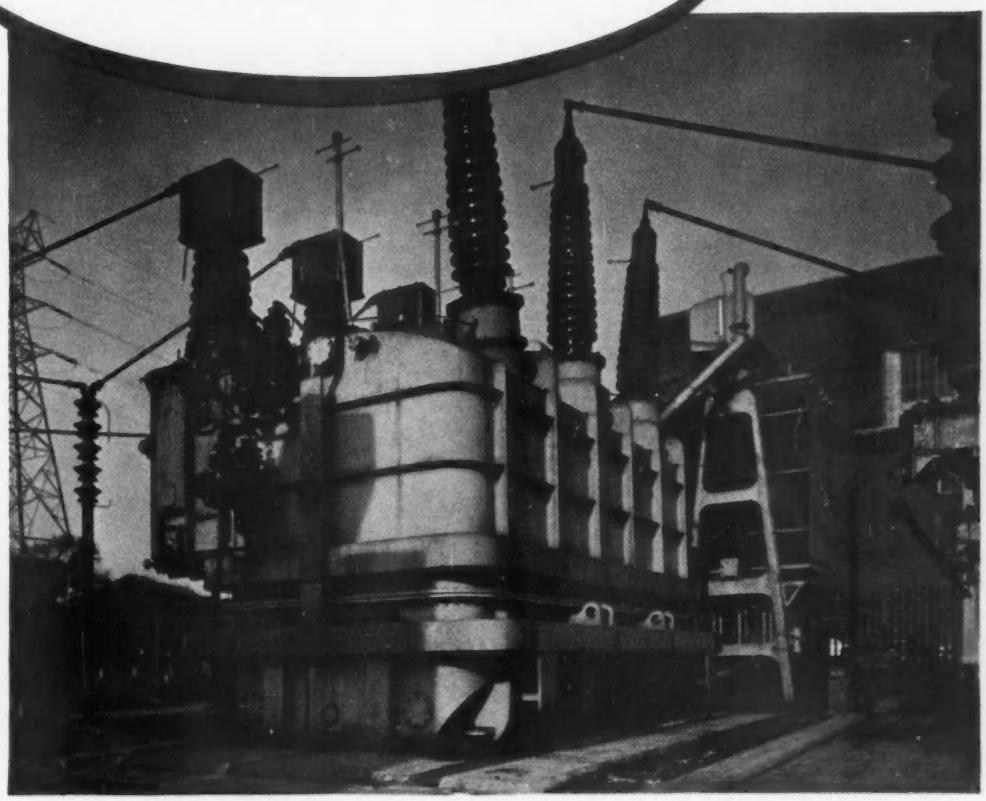
Dividends Declared

Burco Dean. Interim is cut from 5% to 3½%. Directors say trading was "very difficult," but all subsidiaries made a profit, though small.

Dictograph Telephones. Interim 10% (*same*).

International Combustion Africa. Interim 10% (*steady*).

GRID linked to SUPERGRID



The first 180 MVA, 3 phase, 132/275 kV auto-transformer to be completed for the Central Electricity Generating Board.

Illustration shows the first of two of these transformers at the Skelton Grange Substation of the Yorkshire Division of the C.E.G.B.

The transformers, each fitted with resistor transition on-load tap changers, were manufactured at the AEI Rugby Transformer Works.

For further details write to AEI Transformer Division, Southmoor Road, Wythenshawe, Manchester 23 or your local AEI office.

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COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

1 June—St. Albans C.C. Supply of Group "A" concrete lighting columns for conversion scheme.—See 18 May issue.

1 June—Soke of Peterborough C.C. Provision of new supply cable to blocks, Elmside and Harrowdene, at St. John's Close.—See 25 May issue.

1 June—W. Sussex C.C. Electric and gas cooking equipment and machinery for canteen kitchens. Applications to County Architect, County Hall, Chichester, by above date.

2 June—E.B. for N. Ireland. Supply and erection of circulation water pipework and valves at Coolkeeragh.—See 4 May issue.

2 June—Ipswich C.B.C. Alterations and additions to electrical installation in Central Library. Applications to Borough Surveyor, 19 Tower St, by above date.

3 June—Carrickfergus B.C. 83 4 ft 40 W fluorescent lanterns and 129 2 by 2 ft fluorescent lanterns.—See 18 May issue.

3 June—Saddleworth U.D.C. 174 concrete columns/brackets/gear and wiring.—See 25 May issue.

5 June—Aireborough U.D.C. (1) Supply/erection of 59 Class "B" columns/brackets and fitting/wiring of lanterns; (2) supply of mercury vapour lanterns/gear.—Advertised 4 May issue.

5 June—Brighton C.B.C. Electrical installation on fixed-price basis, Teachers' Training College.—See 18 May issue.

5 June—Hereford T.C. Provision of 187 Group "B" lighting units, comprising 29 sodium with new columns with the remaining as tungsten units, and include erection of new columns and conversion and resiting work.—Advertised 18 May issue.

5 June—Northern Ireland. Applications invited for inclusion in approved list of electrical contractors for M. of Commerce.—See 18 May issue.

5 June—S. Liverpool Hospitals. Electrical supplies for specified period. Secretary: Garnet Chaplin, Hospital Management Committee, Sefton General Hospital, Liverpool 15.

7 June—Bingley U.D.C. 48 Class "B" lighting units.—See 25 May issue.

7 June—Newtownabbey. Wired television system.—See 25 May issue.

7 June—N.I. Housing Trust. Electrical installations in 299 dwellings, Dunmurry (Conway). Trust Offices, 12 Hope St, Belfast.

7 June—Wallasey C.B.C. Supply of 52 Group "B" concrete columns and post-top lanterns.—See 18 May issue.

8 June—Harrow B.C. Supply and installation of 15 sodium units, 1,300 2 by 20 W fluorescent units and 150 2 by 40 W fluorescent units for street lighting improvement scheme. Borough Engineer, 48 Uxbridge Rd, Stanmore. Deposit £2.

8 June—Heston and Isleworth B.C. 23 double-arm and six single-arm columns with 400 W mercury fluorescent aero-screened lanterns/gear.—Advertised 25 May issue.

8 June—N. Ireland. Electrical installation in Groomsport (new) primary schools. Details from architects: W. H. McAlister and Ptnrs., 6 Donegall Rd, Belfast 12. Deposit £3 3s.

8 June—Wood Green B.C. 155 Group "A" concrete columns; (b) provision of 40 140 W sodium lanterns/gear; (c) provision of 115 3 x 80 W fluorescent lanterns/gear.—See 25 May issue.

9 June—Hereford T.C. Wiring of 147 houses and 12 bungalows on Newton Farm Five estate.—Advertised 18 May issue.

9 June—Westport, Co. Mayo. (b) Electrical installation comprising 10 kV switch panel, 640 kVA transformer, 1,200 A l.t. switchboard, p.f. correction equipment and distribution system for 427 power points (800 h.p.), 795 lighting points including 623 twin-tube 80 W fluorescent fittings, emergency lighting, 60 socket-outlets, nine water heaters, telephone, clock and fire alarm systems.—See 25 May issue.

10 June—Havant and Waterloo U.D.C. Supply: cable fittings.—See 25 May issue.

10 June—Heywood B.C. Supply of: (1) 60 W so/h lanterns; (2) transformers and capacitors; (3) controllers; (4) columns.—See 25 May issue.

12 June—Dagenham B.C. Electrical installations in 52 houses Oxlow La estate. Borough Engineer and Surveyor, Civic Centre.

12 June—Durham C.C. Supply of (1) electrical laboratory equipment; (2) mining electrical equipment; (3) elementary eng. machinery and equipment; (4) welding machinery; (5) heat engines, for Consett Technical College. Director of Education: G. H. Metcalfe, Shire Hall, Durham.

12 June—Enniskillen B.C. Conversion of mercury to fluorescent street lighting.—See 25 May issue.

12 June—Hetton U.D.C. Supply of (Item 10) electrical equipment for year. Applications to Engineer and Surveyor, Hetton Hse, Hetton-le-Hole, by above date.

12 June—Romsey B.C. Installation of power points in 160 pre-war houses.—See 25 May issue.

12 June—Sedgley U.D.C. 125 Group "B" 80 W mercury fluorescent lighting units on 15 ft concrete columns.—See 25 May issue.

13 June—Cheshunt U.D.C. Provision of metal extension brackets, plus erection and wiring of concrete columns/brackets/200 W sodium lamps/gear.—See 25 May issue.

13 June—Neath R.D.C. New power installations in 74 pre-war houses. Engineer and Surveyor: J. T. Jones, 18 Orchard St. Deposit £2 2s.

13 June—West Riding C.C. (4) Rewiring of Westerton J.M.I. School.—See 18 May issue.

13 June—W. Riding C.C. Applications for inclusion in approved list for (1) work value £1,500 to £5,000; and (2) from £5,000 to £10,000 to County Architect, Bishopgarth, Westfield Rd, Wakefield, by above date. N.I.C. firms only.

15 June—Bridge of Allan B.C. Electrical work in erection of 15 two-apartment and three three-apartment houses, Allandale Rd. Applications to Town Clerk: H. H. Christie, Burgh Chmbrs, by above date.

15 June—Manchester C.C. Supply of (a) 206 G.E.C. sodium lanterns/gear; (b) 203 "Byway" and "Midway" concrete columns; (c) 206 Sangamo timeswitches. City Surveyor, Town Hall, Manchester 2.—Advertised in this issue.

16 June—Lanark C.C. (1) 42 140 W sodium lanterns/gear for A8 Salsburgh scheme; (2) (a) 50 140 W sodium lanterns; (b) 50 transformers; (c) capacitors for A8 Harthill scheme.—Advertised 25 May issue.

17 June—Whitchurch U.D.C. Dismantling of existing lighting and supply/erection/fitting of 70 30 ft steel columns and 200 W sodium lighting.—Advertised 25 May issue.

19 June—Dearne U.D.C. Rewiring of 64 houses, Carby Hall estate, Phase 4. Details from Housing Manager: K. M. Watson, Kelly St, Goldthorpe, near Rotherham. Deposit £2 2s.

19 June—Stocksbridge U.D.C. 255 60 W sodium lighting on 15 ft concrete columns.—See 25 May issue.

28 June—Trim U.D.C. Contract 1. Duplicate pumps capable of 125 g.p.m. at 134 ft head complete with electrical equipment, gauges, water meter, pipework and control equipment. Details from consulting engineers: Nicholas O'Dwyer, Son and Ptnrs., 6 Burlington Rd, Dublin. Deposit £5 5s.

29 June—Wortley R.D.C. Supply/installation of 32 cookers.—See 25 May issue.

30 June—Belfast C.C. Supply and erection of air heater element cleaning equipment at Power Station West. Tender form, N.2484, from consulting engineers: Merz and McLellan, Carliol Hse, Newcastle upon Tyne 1. Deposit £5 5s, made payable to Belfast Corpn. Electricity Dept.—Advertised in this issue.

5 July—Manchester C.C. Electrical installation in extensions to Elizabeth Gaskell College. City Architect, P.O. Box 488, Town Hall.

No date stated—Ayr C.C. Supply of: (1) concrete columns; (2) electrical equipment; (3) 140 W so/h lanterns; and (4) erection, for Kilwinning By-pass roundabout lighting.—See 18 May issue.

No date stated—Somerset C.C. Supply: heavy duty cooking equipment, water heaters, potato peelers, mixing machines, etc.—See 25 May issue.

No date stated—Whitby U.D.C. Contract 238. Supply and erection of 131 Group "A" steel octagonal columns and 250 W colour-corrected mercury lanterns/gear. Engineer and Surveyor, St. Hilda's Terr.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 109 queries answered this week

"Cebe" drawing board light described by "Megohm" in 18 May issue—suppliers of? S.W.E.B.—Fuller Electric Co. Ltd., Fulbourne Rd, E.17.

"Erres" vacuum cleaners—address for? S.S.E.B.—Lee Products (G.B.) Ltd., Elpico Hse, 19-21 Longford St, N.W.1.

"Sumlite" room thermostats—makers of? T.B.—Sumlite Controls Ltd., The Airport, Pendeford, Wolverhampton, Staffs.

"Spiromic" window demisters—makers of? W.C.—A. & R. Electric Co. Ltd., 1 Bruce Ave, Shepperton, Middx.

"Climax" washing machines—makers of? H.H.—The Dexter Foundry Div. of the Philco Corpn., 700 Hunt Ave, Fairfield, Iowa, U.S.A.

"Rubicon" immersion heaters—makers of? T.E.—Controlled Heating Units (London) Ltd., Avenue Rd, Hampton, Middx.

"Pertrix" batteries — suppliers of? G.S.P.—Holsun Batteries Ltd., 107a Pimlico Rd, S.W.1.

"Merriefire" irons—makers of? E.B.—Homefyre Ltd., 10 Sheendale Rd, Richmond, Surrey.

"Carl Neff" cookers — makers of? S.E.B.—Carl Neff, G.m.b.H., Bretten, Bahnhof Str. 9-11, Germany.

"Sternol" transformer oil—makers of? G.B.—Sternol Ltd., Royal London Hse, E.C.2.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

5 June—Honduras. One 3-ph. 3,750 kVA power transformer and 15 100 kVA, ten 25 kVA and 100 15 kVA distribution transformers. Empressa Nacional de Energia Electrica, Apartado Postal 99, Tegucigalpa D.C. B.o.T. (ESB/16600/61).*

6 June—Pakistan. Squirrel-cage induction motors (12 items). Pioneer Traders, Chowk Sadu-Sam, Railway Rd, Multan. B.o.T. (ESB/16812/61/ICA).*

7 June—Australia. Ten 25 kVA 22/2·2 kV signal transformers. Secretary, Victoria Railways, Melbourne C.1. B.o.T. (ESB/16591/61).*

7 June—Costa Rica. Copper wire/cable (three items), lamps, ladders, fuse cut-outs and leather safety bands. Instituto Costarricense de Electricidad, San Jose. B.o.T. (ESB/16801/61).*

7 June—India. Street lighting equipment. Controller of Stores, Maharashtra S.E.B., Fort, Bombay. B.o.T. (ESB/15828/61).*

8 June—America. Capacitor equipment (24 items). Bonneville Power Administration, 1002 N.E. Holladay St, Portland, Oregon. B.o.T. (ESB/17023/61).*

9 June—India. Cooling towers for Barauni Power Station. Additional Chief Engineer, Bihar S.E.B., Patna. B.o.T. (ESB/17029/61).*

10 June—India. Four 1 MVA, five 2 MVA and five 3 MVA 11/33 kV transformers. Elec. Superintending Engineer, Purchase Circle, Bihar State Electricity Board, Patna. B.o.T. (ESB/16845/61).*

10 June—Pakistan. 400 tons h.d. aluminium conductors and accessories (19 items). Director of Purchase, E.P.-W.A.P.D.A., D.I.T. Bldg, Dacca 2. B.o.T. (ESB/16874/61).*

14 June—India. 208 two-ton jib cranes. Chief Erection Engineer, Heavy Electricals Ltd., Post Bag 46, Bhopal. B.o.T. (ESB/16831/61).*

14 June—Pakistan. Two 150 kW diesel-generators. Director of Purchase, E.P.-W.A.P.D.A., D.I.T. Bldg, Dacca 2. B.o.T. (ESB/17033/61).*

16 June—India. Two 2 MVA 11 kV/415 V and two 415 V/11 kV 2 MVA transformers. Secretary, Stores Purchase Committee, Asiatic Bldg, Kempegowda Rd, Bangalore 2. B.o.T. (ESB/16555/61).*

20 June—Canada. Two 6 MVAr 25 kV 3-ph. outdoor capacitor banks. Mr D. M. Stephens, Chairman, Manitoba H.E.B., P.O. Box 815, Winnipeg 1. B.o.T. (ESB/16596/61).*

20 June—Pakistan. Capacitors (18 items). Mr F. Rizwi, Purchase Co-ordinating Officer, Block 32, Posts and Telegraphs Directorate General, Karachi. B.o.T. (ESB/16859/61).*

21 June—Rhodesia and Nyasaland. Cables, joint boxes and sealing ends (seven items). Town Clerk, P.O.B. 591, Bulawayo. B.o.T. (ESB/17931/61).*

27 June—India. 66 kV disconnecting switches for Jaldhaka H.E. Project. Chief Engineer, 14 Princep St, Calcutta 13. B.o.T. (ESB/17037/61).*

3 July—Australia. 6·6 kV 250 MVA and 415 V 25 MVA switchgear and metering/protective gear. 240 V and 50 V d.c. control and alarm systems. Secretary, State Electricity Commission of Victoria, 22-32 William St, Melbourne C.1. B.o.T. (ESB/16590/61).*

3 July—India. Two 15 kW 10,000 c/s high frequency generators. Purchase Division, Atomic Energy Establishment, Trombay, Mohatta Bldg, Palton Rd, Bombay. B.o.T. (ESB/17027/61).*

6 July—America. Advance notice: 13 212,400 h.p. hydraulic turbines for Lower Monumental and John Day dams. Walla Walla District Corps of Engineers. B.o.T. (ESB/16594/61).*

11 July—India. (1) Penstock and (2) 50,000 h.p. turbine, 35 MW alternator, auxiliaries, transformer and switchgear for fourth set at Periyar H.E. scheme—Stage II. Chief Engineer for Electricity, Madras S.E.B., 157 Mount Rd, Madras 2. B.o.T. (ESB/16809/61).*

19 July—India. 132 and 33 kV transformers and switchgear for Allahabad and Kanpur substations. Director of Designs, Rihand H.E. Design Directorate, 10/499 Allenganj, Kanpur. B.o.T. (ESB/16808/61).*

31 July—Trinidad and Tobago. Switchgear and structures for 33 kV Point Fortin substation. Purchasing Officer, Electricity Commission, P.O. Box 121, Port of Spain.—Advertised in this issue.

16 Aug.—India. Substations and switching stations for 25 kV railway electrification, Tambaram-Villupuram section of Southern Region. General Manager and Chief Engineer, Railway Electrification, 235 Acharyya Jagadish Bose Rd, Calcutta 20. B.o.T. (ESB/16882/61).*

4 Sept.—Trinidad and Tobago. Contract 215. Two 475 klb/hr steam generating units and ancillary plant for Port of Spain "B" power station. Contract 217. 33 kV switchgear for Trinidad and Tobago Electricity Commission. Documents from and fee £15 made payable to Preece, Cardew and Rider, 8-10-12 Queen Anne's Gate, S.W.1, references 1054/1010 and 1054/1012, respectively.—Advertised in this issue.

TRADE NOTES

New Headquarters. New six-storey headquarters of Lee Beesley (Birmingham) Ltd., at 119 Holloway Head, Birmingham, were completed last week. The Telephone No. is: Midland 9541.

Agent. Cawkell Research and Electronics Ltd. have appointed Hird-Brown Ltd., 244 Marsland Rd, Sale, as their agents for Cheshire, Yorks, Durham, Lancs, Westmorland, Cumberland, Northumberland and N. Wales.

Service closed. A.E.I. are to close their service depot for Ediswan Mazda cathode ray tubes at 92 Oxford Rd, All Saints, Manchester 13, from June 2. Service to dealers in the North West area will be maintained after that date from the depot at 53 Trafalgar St, Sheffield 1.

S. Africa Import Regulations. Under changes to import controls recently announced by South Africa, permits for the import of electricity meters, farm lighting plants, hearing aids and electro medical appliances, will be issued to registered importers upon satisfactory completion of form Execon 60. Initial quotas equal to 50% of the 1960 allocations granted up to 31 Aug., 1960, will be granted in respect of vacuum cleaners and vacuum cleaner/floor polisher combinations for 1961. Certain imports of refrigerators, washing machines, irons, toasters, electric lamp bulbs and radio apparatus may also be allowed.

CONTRACTS PLACED

Folkestone B.C. Electrical and plumbing work in modernisation of 99 houses, Dallas Brett Cres, John Hawkes Ltd., £4,666. Recommended.

Fylde R.D.C. Class "A" and Class "B" lighting schemes. A.E.I. Lamp and Lighting Co., £3,549.

Hastings B.C. Supply of 64 Sapphire lanterns for Bexhill Rd lighting, A.E.I. Lamp and Lighting Co., £1,001. Recommended.

Hebburn U.D.C. Electrical installations in Station Rd maisonnettes, Norman Robinson, £3,981.

Herne Bay U.D.C. Provision of Eddington and Greenhill roundabout lighting, Abacus Municipal Ltd.

Hindley U.D.C. Rewiring and power installations in 140 pre-war houses, W. H. Clarke, £853.

Kingston upon Hull C.C. Electrical installations in Bethune County Primary School and Boothferry estate shops and maisonnettes, A. Lee.

Luton B.C. Electrical installation in slaughterhouse, Cawdells of Luton Ltd., £1,908. Recommended.

Manchester C.C. Supply of equipment and electrical work in communal laundries at Miles Platting and Churnet St, Sadler and Kinsey Ltd. and G. W. Henry Ltd., respectively. Recommended.

Stockport B.C. Electrical installations: in 62 dwellings, Canal Bridge estate, H. P. Dowell and Sons, £2,587; St. Anne's R.C. School, Hallams (Electrical Contractors) Ltd., £6,377; lift installation, Reinbeck Home extensions, Marryat and Scott Ltd., £2,020.

Surrey C.C. Electrical work at Rivermead County Secondary School, Kingston upon Thames, Holliday, Hall and Stinson Ltd., £18,736. Recommended.

Swansea B.C. Electrical installation in Training College, Clarke Bros. (Stroud), £7,039.

Tyne Improvement Commission. Supply of ten-ton diesel/electric crane for Albert Edward Dock, North Shields, Steels Eng. Products Ltd.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Aeroflex Deelynk. 814,365. Class 9. Safety fuses, etc. Parmiter Hope and Sugden Ltd., Fluvent Electrical Wks, Newton Ave, Longsight, Manchester 12.

Arburg. 814,633. Class 9. Apparatus, etc. Arburg Feingeraetefabrik O.H.G. Hehl and Soehne, Lossburg, Wuettemberg, Germany.

Lucas Gold Star in design. 798,616. Class 11. Lamps. Joseph Lucas Ltd., Gt. King St, Birmingham 19.

Mimicount. 788,073. Class 9. Apparatus for automatic regulation of speed and operation of electrical machinery, etc. Lancashire Dynamo E.P. Ltd., B.E.P. Wks, Brereton Rd, Rugeley, Staffs.

Neutrotherm, 782,785; and **Neutronit,** 782,788. Class 9. Magnets, electrotechnical apparatus, etc. Gebr. Bohler and Co., Aktiengesellschaft, Elisabethstrasse 14, Edelstahlwerk, Vienna 1, Austria.

Samicaflex. 806,709. Class 17. Insulators made from or containing mica. Samica Societé de Applications du Mica, 8, rue d'Anjou, Paris, France.

Siesta. B787,853. Class 10. Pads and blankets. Thermolectrics Ltd., Chapel Wks, Church St, Hampton, Middx.

Siran. 803,066. Class 9. Switches, battery chargers, etc. Donland Electronics Ltd., Livingstone Hall, Livingstone Rd, Hove 3.

Unimaster, 811,745; and **Testmaster,** 811,746. Class 9. Measuring instruments, etc. Tesa S.A., 12 Rue de la Savonnerie, Renens, Vaud, Switzerland.

Weltronic. 802,755. Class 9. Apparatus for automatically controlling welding equipment. Weltronic Co., 19500 West Eight Mile Rd, Detroit, Michigan, U.S.A.

BUSINESS PROSPECTS

Andover. Proposed: residential development of five acres, Anna Valley, by R. B. Southwell.

Aylesbury. Proposed: £250,000 offices for Nestlé Co. Ltd. Architects: Beard, Bennett, Wilkins and Ptnrs., Baker St, W.1. Factory/offices, Dollicott, Heddenham, proposed by Chartair Ltd.

Basingstoke B.C. Tender: 413 dwellings, two- and three-storey flats, South Ham estate. Architect.

Bedlington. Wm. Leech Ltd., St. James's St, Newcastle, propose blocks of three-storey flats, Wansbeck estate.

Billingham. Brims and Co. Ltd., City Rd, Newcastle, contractors for Furness Shipbuilding Co. Ltd. office block.

Birkenhead. B.C. plan £170,000 chemical engineering dept. for Technical College.

Birmingham C.C. Tender: 36 one- and two-storey dwellings, Highcroft estate, West Heath. City Architect.

Blaydon. Proposed: residential hotel, Shibdon Rd. Stephenson, Gillis and Ptnrs, Saville Chmbrs, Newcastle, architects.

Bolton. B.C. propose grammar and modern schools, Breightmet estate. Architect.

Bournemouth. Proposed: by Imperial and Grand Hotels Ltd. multi-storey car park, bowling alley, supermarket/shops/offices, site of Grand Hotel; and 12/13-storey flats, Imperial Hotel.

Bradford. C.C. propose junior/infants' school, Allerton. Architects: Walker and Collinson, The Exchange, Bank St.

Brighton. William Willett (Contractors) Ltd., Grand Ave, Hove 3, propose factory, Lower Bevendean. Kenneth Anns and Ptnrs., Lincoln's Inn Fields, W.C.2, architects for proposed 14-storey shops/flats, site of Albemarle Hotel, Marine Parade.

Bristol. Beaverbrook Newspapers Ltd., Fleet St, E.C.4, propose development of site, Dale St, Frome St.

Bucks. C.C. propose teachers' training college for women, Holton Park, Wheatley.

Camborne. Tecalemit Ltd., Plymouth, propose 15-acre factory, Pool. Industrial Estates Management Corpn., Team Valley estate, Newcastle 11.

Cardiff. Proposed: £375,000 new block and wing for National Museum of Wales, Cathays Park. Architects: T. Alwyn Lloyd and Gordon, 6 Cathedral Rd.

Carlisle. Prices Tailors Ltd., Cardigan Cres, Kirkstall Rd, Leeds 4, and Littlewoods Mail Order Stores Ltd., Liverpool, propose redevelopment of their property, English St.

Chadderton. Northmix Ready Concrete Ltd. plan major extensions on land adjoining Chadderton Power Station.

Chesterfield. Proposed: steel foundry, Pottery La, for Alloy Steel and Iron Co., Carbrook St Foundry, Sheffield 9.

Chester-le-Street. Proposed: large warehouse/offices, Pelaw Farm Hill, for London and Newcastle Tea Co. Ltd., Clayton St, Newcastle.

Consett. J. Walton Taylor and Sons, St. James's Chmbrs, Gallowgate, Newcastle, architects for proposed £50,000 offices/restaurant, for Venture Transport Co.

Coventry. C.C. propose rebuilding of Walsgrave C.E. School and City of Coventry School. Architect.

Cricklade and Wootton Bassett R.D.C. Tender: 20 dwellings, Lyneham. Surveyor, Wootton Bassett.

Croydon. Planned: multi-storey car park, costing £400,000, Surrey St.

Derby. Congregational Authorities propose demolition of church, Victoria St, and erection of shops with church premises over. Trollope and Colls Ltd., Noble St, E.C.2, contractors for Rolls-Royce engineering works/offices, Sinfin.

Dewsbury. Planned: industrial development on 5½ acres, Mill St East, for Rt Hon Lord Savile, Dewsbury.

Dorking. S.E.E.B. plan offices/stores, Ridgeway Rd.

Durham. Isaac Berriman Ltd., Fencehouses, Co. Durham, contractors for TAAFA headquarters, Old Elvet.

Easington. R.D.C. propose electrical rewiring of 60 houses, Hawthorne Cottages, South Hetton.

Eastleigh. Proposed: factory/offices, Woodside Rd, for Hill Construction Co. (Engs.) Ltd., Wide La, Swaythling, Southampton.

Gateshead. J. W. Taylor and Sons, St. James's Chmbrs, Gallowgate, Newcastle, architects for proposed Kavli Ltd. factory extensions, Team Valley estate. Warehouse/offices, Team Valley trading estate, proposed by Walter Willson Ltd., Groat Market, Newcastle.

Glasgow. Fibreglass Ltd., Ravenhead, St. Helens, propose factory/warehouse, Springburn Rd. Factory, Cathcart Rd area, proposed by Jas. Templeton and Co., Templeton St, S.E. Stores/offices, 67 Colvend St, planned by G. and J. Thompson of that address. £75,000 Highlanders' Institute, Berkeley St, proposed; architects: Thomson McCrea and Sanders, 212 Bath St, Glasgow C.2.

Guildford R.D.C. Tender: modernisation of 44 houses, Ash. Housing and Valuation Officer.

Halifax. J. Mathewson, Alleyn Pk, S.E.21, architect for proposed extensions to John Mackintosh and Sons Ltd. factory, Albion Mills.

Hastings. L. G. Hawkins and Co. Ltd., Drury La, W.C.2, propose industrial development, four acres, Pondswood.

Hove. Factory/offices proposed by John Lancaster Radiators Ltd., Brunswick St East; architects: Morgan and Carn, Grand Ave, Hove.

Hull. Health Committee propose maternity and welfare clinics, Greatfields estate and Ashley Park Rd.

Keighley. B.C. propose £16,500 street lighting conversions, South St and North Beck.

Leeds. Offices / warehouse / showrooms, Armley Rd, proposed by Merriman and Howard Ltd.

Leicester. Planned: new factory for Dryad Ltd., furniture manufacturers, of Northgates, Leicester. C.C. propose 52-bed county home, Market Harborough, costing £75,000. County Architect, Leicester.

Liverpool C.C. Tender: 40 dwellings, various sites. City Architect.

London. Propose rebuilding of Royal Marsden Hospital, Fulham Rd, Chelsea, to cost £3 million. Waring and Nicholson, surveyors, 38 Parliament St, S.W.1, propose shops/offices/90 flats, Old Kent Rd, Commercial Way, S.E. R. Lyon (Estates) Ltd., Hersham, Walton-on-Thames, propose eight-storey offices, Upper Richmond Rd, S.W.1. Four- and five-storey offices/shops/flats, Vauxhall Bridge Rd, proposed by Griggs and Son, Victoria St, S.W.1. Collier and Madge, surveyors, 68 Fleet St, propose 11-storey offices/flats, etc., Uxbridge Rd, Lime Grove, Hammersmith. Shingler and Risdon, 47 Bedford Row, W.C.1, propose shops/showrooms/hotel/offices, High St, Kensington.

Manchester. Lane, Fox and Co. Ltd., building contractors, High Barnes Wks, Stockton, propose offices/showroom/service flats/multi-storey car park, next London Rd railway station.

Market Harborough. Secretary of State proposes security prison on part of former R.A.F. station. Architects' Dept., Abell Hse, John Islip St, S.W.1.

Midlothian. C.C. propose two factories, one for Miller and Stables Ltd., 15 Duncan St, Edinburgh 9, costing £40,000; and the other at Eastfield Drive, Penicuik, for Wm. Thyne (Hldgs) Ltd., Edinburgh, costing £60,000.

Motherwell. Grampian Properties Ltd., Glasgow, propose £100,000 hotel, Merry St. Architect: Wm. Nimmo, Commercial Bank Chmbrs, Wishaw.

Newcastle. W. B. Edwards and Ptnrs, Cathedral Bldgs, Dean St, architects for proposed department of agriculture, College Ave, for King's College.

Northampton. Morphy-Richards Ltd., St. Mary Cray, Orpington, propose new factory, Weedon Rd industrial estate.

North Riding C.C. Tender: three-storey extension to County Hall, Northallerton. County Architect, Northallerton.

Northumberland. C.C. propose £100,000 additions to Kirkley Hall Farm Institute for another 60 students. C.C. propose old people's homes, Berwick and Ashington, each costing £80,000. County Architect.

Northwood. N.W. Metropolitan Hospital Board, Eastbourne Terr, W.2, propose radio biology laboratory, Mount Vernon Hospital.

Norwich. Piper Whalley and Ptnrs., 88 Thorpe Rd, architects for proposed new Balding Eng. Co. factory.

Oswestry. Birmingham Regional Hospital Board, Edgbaston, propose out-patients' dept., Oswestry and District Hospital.

Paisley. Holland and Hannen & Cubitts (Scotland) Ltd., 127 St. Vincent St, Glasgow, contractors for £1¼ million Pressed Steel Co. factory, Linwood.

Pembrokeshire C.C. Wm. Eaves and Co. Ltd., Haverfordwest, awarded contract for £89,888 old people's home, Narberth.

Portsmouth. Wessex Regional Hospital Board, Winchester, propose nurses' training school, St. James's Hospital. Architect: L. Chandler, Grove Rd, Southsea.

Purfleet. Holloway Bros. (London) Ltd., Millbank, S.W.1, contractors for £1½ million Thames Board Mills Ltd. extensions of three acres.

Ramsgate. Cotton, Ballard and Blow, 5 Baker St, W.1, architects for proposed supermarket, Palace Theatre site, for Central Commercial Properties Ltd.

Redruth. Walls and Pearn, Prudential Bldgs, Armada Way, Plymouth, architects for proposed Tecalemit factory.

Romford. Sleepy Valley Ltd., bedding manufacturers, Weymouth Terr, Shoreditch, propose new factory, Harold Hill.

Salford. Proposed: offices/warehouse, Hope St, for Mantell Brereton Ltd., 113 Oldfield St, Manchester 5.

Salisbury. Wessex Regional Hospital Board, Winchester, propose out-patients' dept. and upgrading children's ward, Odstock Hospital.

Saltash. B.C. propose Group "A" sodium lighting, North Rd, New Rd and Liskeard Rd.

South Shields. Three-storey shops, Ocean Rd, proposed by London and Northern Properties Ltd., 9 Benton Terr, Newcastle.

Stanley U.D.C. Kitching and Co., 21 Albert Rd, Middlesbrough, architects for proposed £189,000 new swimming baths, Kings Head field.

Stockport T.C. Tender: South West Secondary School, Frewland Ave, Davenport. Architect, Stockport.

Sunderland. Ericcson Telephones Ltd. propose 44,000 sq ft factory extensions. Architects: Newrick and Blackbell, 58 John St, Sunderland. Dowsett Engineering Contractors Ltd., Low Fell, Gateshead, contractors for extensions to Hendon Paper Wks, Grangetown.

Surbiton. Planned: extensions to factory of Kingston Instrument Co. Ltd., Cox La.

Swindon. B.C. propose industrial estate factory for Sealey Eng. Co. Ltd.

Thorne. Proposed: £200,000 store, Silver St, by Doncaster Co-op. Soc. Staff Architect.

Truro R.D.C. Tender: 36 dwellings, various sites. H. Snellgrove and Ptnrs., 47 Coinagehall St, Helston.

Wakefield. B.C. propose £26,500 conversion of street lights in several areas and further £5,500 schemes for relighting Ings Rd and Dewsbury Rd.

York C.C. Tender: 68 dwellings, The Groves redevelopment area. City Architect.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Electro-Horticultural Services Ltd. Creditors to send details to liquidator, J. S. Meyler, 2 Marlborough Pl, Brighton 1, by 30 June.

Beadec (London) Ltd. Meetings of members and creditors to be held at 272-276 Pentonville Rd, N.1, on 3 May, at 2.45 and 3 p.m., respectively.

Ristona Products Ltd. Creditors to send details to liquidator, P. Cordwell, 93 Queen St, Sheffield 1, by 30 June.

Walter (Sales) Ltd. Creditors to send details to liquidator, H. W. Pitt, 100 Park St, W.1, by 15 June.

Washer Services and Supplies Co. Ltd. Creditors to send details to liquidator, G. H. Eaves, 47 Mosley St, Manchester 2, by 30 June.

Mersey Domestics Ltd. Creditors to send details to liquidator: C. A. Huntingdon, 41 North John St, Liverpool 2, by 31 May.

Brooks Washing Machines Ltd. Mr. G. E. Radford, 12 Portland Pl, Southampton, appointed liquidator for the purpose of voluntary winding up as from 15 May.

S. and R. Domestic Appliances (Wakefield) Ltd. Mr R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, appointed liquidator for the purpose of voluntarily winding up as from 15 May.

Marshall and Owen Ltd. Mr. J. G. Simpkins, 62-63 High St, Exeter, appointed liquidator for the purpose of voluntarily winding up as from 10 May.

Northolt Electrical Services Ltd. Meeting of creditors, Hall 16, Winchester Hse, Old Broad St, E.C.2, at 2.30 p.m., 8 June.

Longford Electrical Co. Ltd. Mr. A. T. Eaves, 47 Mosley St, Manchester 2, appointed liquidator as from 10 May.

Victoria Instruments Ltd. Meeting of members, 32 Queen Anne St, W.1, on 30 June, at 3 p.m., for the purpose of having an account of the winding up laid before them.

Voluntary Liquidation

Walter (Sales) Ltd., Garth Rd, Morden, Surrey, electrical and radio distributors.

The statement of affairs showed liabilities amounting to £25,610 with assets of a book value of £24,013 being estimated to realise £14,150.

Trading figures revealed that from 1 May, 1958, to 31 Dec., 1958, there was a net profit of £34 (turnover £230,309), but the following year a net loss of £231 on turnover of £567,069. Turnover as from 1 Dec., 1960, to 15 Feb., 1961, declined to £320,994 with a net loss of £1,489.

The appointment of Mr H. W. Pitt, 100 Park St, W.1, was confirmed as liquidator.

BANKRUPTCY ACTS

Receiving Orders

High Court of Justice. A. J. Cicale, electrical dealer, of 385 Nether St, Finchley, N.3. Receiving order dated 12 May.

High Court of Justice. R. C. Gallane, electrical appliance distributor, trading as R. C. Gibson and Co., of 112 Brondesbury Villas, Maida Vale, N.W.6. Receiving order dated 12 May.

Blackwood, Tredegar and Abertillery. J. Jones, radio, television and electrical goods dealer, formerly carrying on business at 74 High St, Blaina. Receiving order dated 16 May.

Kingston upon Thames. T. Hawkins, electrical dealer, formerly trading as Electromestic, of 18 Gap Rd, S.W.19. Receiving order dated 12 May.

First Meeting and Public Examination

Bristol. J. W. Hares, electrical contractor, carrying on business at 20 Bath Rd, Warmley, Gloucester. First meeting: 1 June at 11.30 a.m., at Official Receiver's Office, 26 Baldwin St, and public examination: 10.30 a.m., 8 Sept., at The Old Court Hse, Corn St, Bristol 1.

Release of Trustees

Croydon. G. G. Brittain, radio, television and electrical engineer and retailer. Trustee: A. W. Hunter, Walter Hse, 418/422 Strand, W.C.2, released as from 10 Nov., 1960.

Torquay. L. J. Wotton, radio and electrical engineer, carrying on business at 76 Babbacombe Rd. Trustee: J. E. Ellis, Marlborough Hse, Marlborough Rd, Plymouth, released as from 28 April.

Application for Discharge

High Court of Justice. C. T. Pratt, manufacturer of hardware and electrical fittings, formerly carrying on business at 388 and 396 Essex Rd, N.1. Application for discharge to be heard at 11 a.m. 9 June at Bankruptcy Bldgs, Carey St, W.C.2.

MEETINGS TO NOTE

THURSDAY, 1 JUNE

ELECTRICAL CONTRACTORS' ASSOCIATION JUBILEE CONFERENCE at Torquay until 5 June.

MONDAY, 5 JUNE

I.E.E. (Western). A.G.M. University Eng. Laboratories, University Walk, Bristol. 6 p.m.

TUESDAY, 6 JUNE

ASSOCIATION OF MINING, ELECTRICAL AND MECHANICAL ENGINEERS. Annual conference at Harrogate until 9 June.

INSTITUTION OF PLANT ENGINEERS. "Telecommunications." S. Welch. Royal Society of Arts, John Adam St, W.C.2. 7 p.m.

WEDNESDAY, 7 JUNE

BIRMINGHAM CHAMBER OF COMMERCE AND B.I.M. Public debate, "Should Resale Price Maintenance be Abolished." Large Lecture Theatre, Dept. of Mechanical Eng, Edgbaston. 2.30 p.m.

MONDAY, 12 JUNE

BRITISH ELECTRIC POWER CONVENTION at Eastbourne until 15 June.

WEDNESDAY, 14 JUNE

INSTITUTION OF PRODUCTION ENGRS. Viscount Nuffield paper, "Some Aspects of Engineering Progress." Sir Willis Jackson. Large Lecture Theatre, Eng Faculty, Bristol University 6.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Admirable Electrics Ltd., 6 Surrey St, W.C.2. Manufacturers of and dealers in vacuum cleaners, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Stanley H. Lucas and Francis A. Dean.

Beme Research and Development Ltd., 24 Upper Brook St, W.1. To carry out research and development work in connection with electrical and mechanical equipment, etc. Nom. cap.: £100. Dirs.: Francis P. Parfitt and John D. Mansfield-Robinson.

D. G. and S. A. Brown Ltd., 2 Valley Hill, Loughton. Manufacturers of and dealers in electrical and other equipment, etc. Nom. cap.: £5,000. Dirs.: Dennis G. Brown and Sidney A. Brown.

Child, Beatty (Communications) Ltd., Creek Hse, High St, Kingston upon Thames, Surrey. Electrical and telecommunications engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: Cyril Bailey and Reginald V. A. Tobin.

Desouter Products Ltd. Manufacturers of and dealers in pneumatic, hydraulic and electric tools and machinery, etc. Nom. cap.: £250,000. Dirs.: to be appointed by subs. Subs.: Dianan Brodigan and G. G. Ellston, 59/67 Gresham St, E.C.2.

Electrical Installation (Northampton) Co. Ltd. Nom. cap.: £2,000. Dirs.: Geo. H. Midwinter and Harold G. Dee, 31 Broadmead Ave, Northampton.

Electrical Ltd., 34 Waterloo Rd, Wolverhampton. Electricians, etc. Nom. cap.: £5,000. Dirs.: not named. Subs.: Howard G. Turton and Wm. H. Hingley.

G.E.C. (Home Products) Ltd., Industrial and commercial holding company, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: P. M. Bevan-Thomas, 23 Wimpole St, W.1; and R. B. Catlow.

Harriss and Masters Ltd., 60 Station Rd, E.4. To take over business of automobile, diesel and electrical engineers and factors carried on as "H. and M. Auto Electrical" at Station Rd, E.4. Nom. cap.: £5,000. Dirs.: John W. Harriss and Ronald Masters.

Hill and Oliver Electrics Ltd., 12 Enville St, Stourbridge. Nom. cap.: £1,000. Dirs.: Robert F. Hill, George E. Oliver, William T. Green and William H. Oliver.

M. Jacobs (Electric) Ltd., 61 Brushfield St, E.1. Nom. cap.: £100. Dir.: M. Jacobs.

Janorken Ltd., 13 Well Court, Bow La, E.C.4. Electrical, radio, television, mechanical and general engineers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Laurence R. Battell and William J. Wildman.

Keyswitch Relays Ltd., 2 Irongate Wharf Rd, W.2. Manufacturers of and dealers in electrical relays, switchboards, etc. Nom. cap.: £10,000. Dirs.: Maurice Hatter, David Davis, Frances Hatter and Flora P. Davis.

Marcus Electrics Ltd. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Dorothy M. Graeme and Paul G. Graeme, 61 Fairview Ave, Gillingham, Kent.

Marsh and Hendry Ltd., 185 High Rd, Leyton, E.15. Builders and electrical engineers and contractors, etc. Nom. cap.: £100. Dirs.: Victor C. W. Marsh, Patricia A. Marsh and Fredk. C. Hendry.

Masons (Southsea) Ltd., 114 Devonshire Ave, Southsea, Hants. Electrical engineers, etc. Nom. cap.: £5,000. Dirs.: Leonard J. Mason and Mrs N. Mason.

Oil Burner and Electrical Maintenance Ltd., 55 Regent Rd, Leicester. Nom. cap.: £1,000. Dirs.: not named. Subs.: F. Johnson and I. W. Goodman.

Perins Electric Ltd., 58 West St, Alresford, Hants. Electrical engineers, etc. Nom. cap.: £2,000. Dirs.: Percy E. Burchett, Peggy D. A. Burchett and John J. O'Connor.

Rose and Davies Ltd., 18a Station Approach, South Ruislip. Electrical contractors, etc. Nom. cap.: £2,000. Dirs.: John A. Rose, Reginald F. Rose and Charles F. Rose.

D. Selwood and Co. Ltd., 5 Middle Row, Stevenage Old Town. Radio, television, electrical and electronic engineers, etc. Nom. cap.: £100. Dirs.: Denis Selwood and Mrs J. A. Selwood.

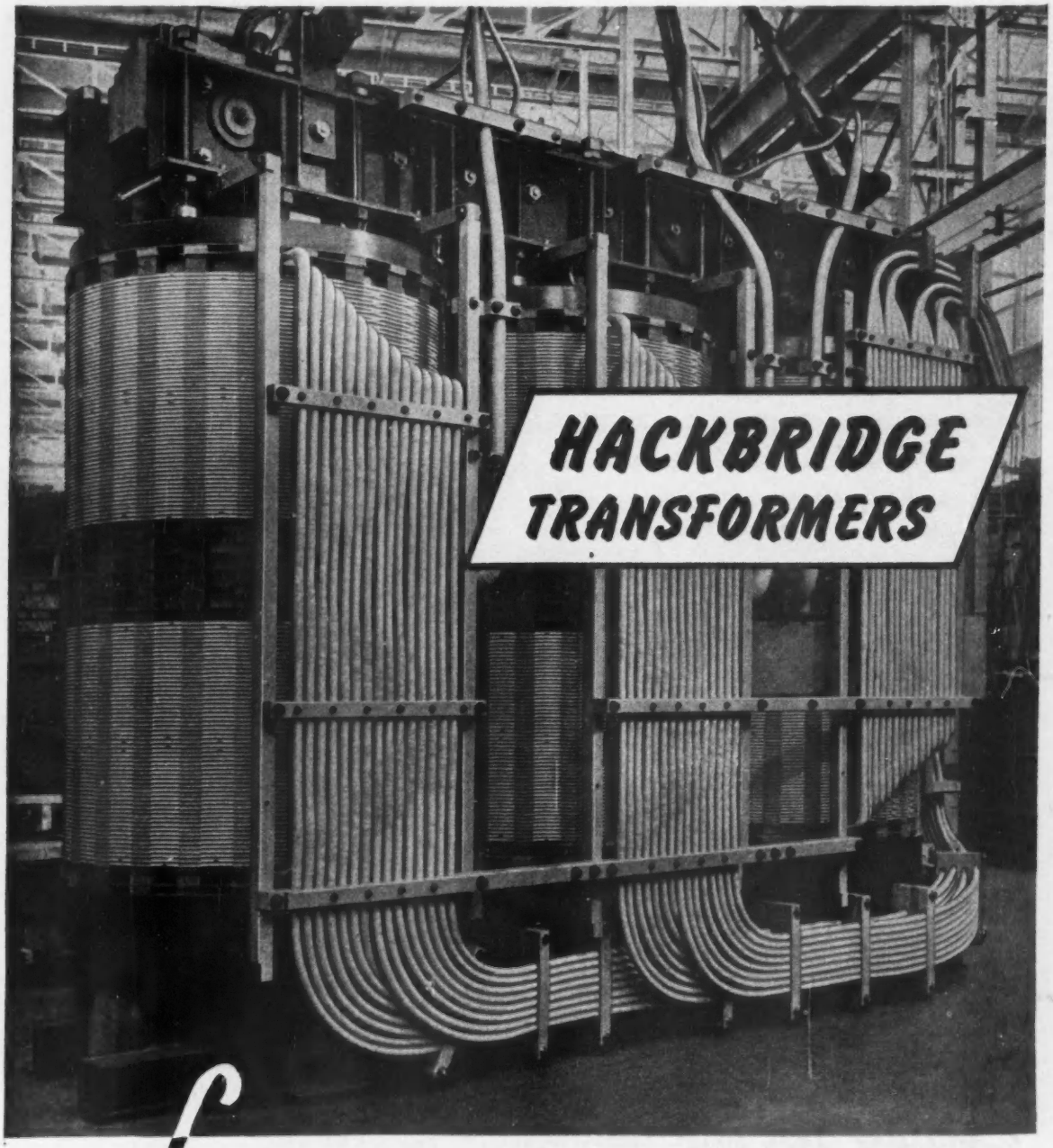
Southair Ltd., 23 Albert Rd, Horley, Surrey. Electrical equipment specialists, etc. Nom. cap.: £5,000. Dirs.: David G. Coxon and Robert J. Coxon.

F. G. Taylor (Electrical) Ltd., 17 Brazennose St, Manchester 2. Nom. cap.: £500. Dirs.: Fdk. G. Taylor and Bernard G. Taylor.

T.H.S. Enterprises Ltd., 57 Huntley Ave, Spondon, Derby. Manufacturers of and dealers in furniture, electrical appliances, etc. Nom. cap.: £100. Dirs.: Richard G. Hargreaves and Muriel J. Sulley.

Washer Services (Sutton) Ltd., 89 Outram St, Sutton in Ashfield, Notts. Electricians, etc. Nom. cap.: £3,500. Dirs.: Jack Caunt and Mrs A. Caunt.

F. Webb and Son (Leicester) Ltd. Electrical engineers, etc. Nom. cap.: £5,000. Dirs.: not named. Subs.: Fredk. H. Webb, 15 Cank St, Leicester; and Stanley W. Whait, 2 Wycliffe St, Leicester.

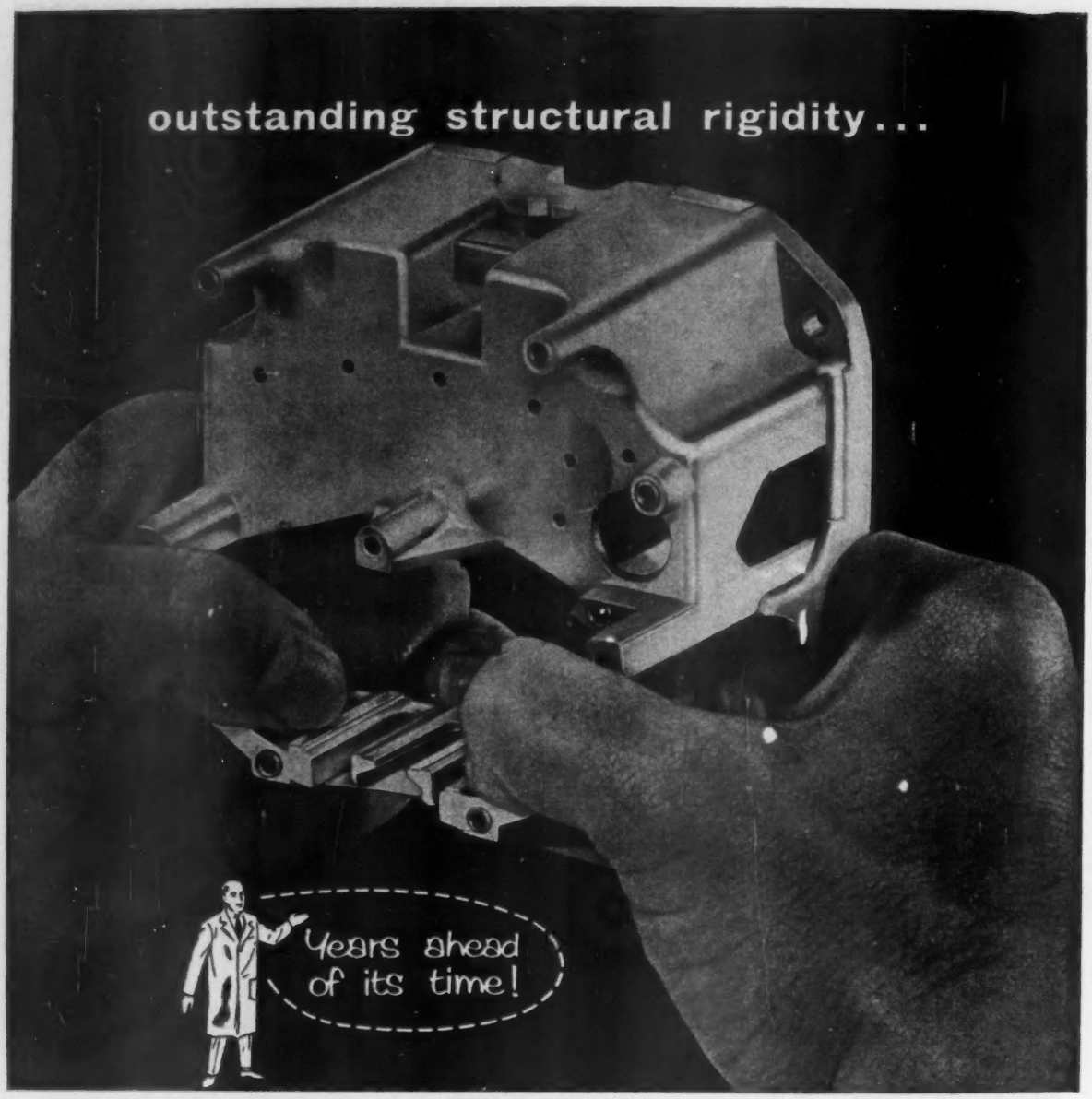


for Skelton Grange B POWER STATION

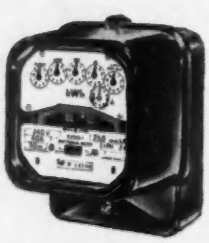
Central Electricity Generating Board, Yorkshire Division

Two 144 MVA 13.8/145.8 kV type OFW Hackbridge transformers as illustrated are being installed at this station. These are in addition to the six 70 MVA 11/134 kV units for Skelton Grange "A" supplied between 1950 and 1954.

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 28833 (8 lines) Telegrams & Cables: "Electric, Walton-on-Thames"



Consider this grid casting... The SANGAMO Watthour Meter embodies the very finest in materials and design. The grid casting is an outstandingly fine example of modern production technique. Made from an aluminium silicon alloy of absolute stability, it is a one-piece pressure die-casting on which no subsequent machining operations are performed. No maintenance of any sort is required. By utilising the most advanced quantity production methods in the world's most modern meter factory, it has been possible to incorporate better materials, better workmanship and better design features with the utmost economy. Thus the benefits of increased demand are passed on to the user.



SANGAMO WESTON

sangamo

MODEL S200-7 SINGLE PHASE WATTHOUR METER

SANGAMO WESTON LTD., ENFIELD, MIDDX., ENGLAND · Tel: Enfield 3434 (6 lines) & 1242 (6 lines) · Grams: Sanwest Enfield
SW/77

CLASSIFIED ADVERTISEMENTS

PUBLIC NOTICES

CAROLINE HASLETT MEMORIAL TRUST
AWARD OF TRAVELLING EXHIBITION

The Management Committee of the Caroline Haslett Memorial Fund (Electrical Section) invite from women with considerable experience in the Electrical Industry applications for the award of a Travelling Exhibition in domestic electrification. The value of the Exhibition and the duration of the tour will depend on the country finally selected by the Committee which this year will probably be in Europe or the Middle East.

Applicants will be required to send to the Management Committee with completed application forms a project or projects for such an Exhibition.

Application forms, which should be returned before July 12th, may be obtained from:

The Caroline Haslett Memorial Trust,
25 Foubert's Place,
London, W.1.

(B 45)

TENDERS INVITED

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (NORTHERN IRELAND) 1954
City of Belfast Electricity Department

TENDERS are re-invited for the Supply, Delivery and Erection of:

Air Heater Element Cleaning Equipment at Belfast Municipal Electric Power Station West (including washing tank of approx. 3,600 gallons capacity, pipework and valves for steam and water services, steel-framed asbestos-sheeted plant house with 1-ton overhead electric travelling crane).

Form of Tender (N.2484), Conditions and Specification, in quintuplicate, may be obtained from Messrs. Merz and McLellan, Consulting Engineers, Carliol Hse, Newcastle upon Tyne 1, on payment of a deposit of five guineas which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the tender document may be obtained at one guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Air Heater Element Cleaning Equipment, Electricity Department," and endorsed with the name and address of the tenderer, must be addressed to the Town Clerk, City Hall, Belfast 1, so as to reach him not later than 4 p.m. on Friday, 30 June, 1961.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

C. A. R. SHILLINGTON,
Chairman.
Northern Ireland Joint Electricity Committee.

43 Waring St,
Belfast 1. (B 74)

GHANA SUPPLY COMMISSION

THE Ghana Supply Commission invite manufacturers to submit quotations for the following:

Ref.: ELEC.4058/1. Description: 4,600 Fluorescent Lighting Fittings complete, and Fluorescent Tubes.

Forms of Tender will be obtainable as from 22 May on payment of a fee of £1 from the Secretary, Ghana Supply Commission, P.O. Box M.35, Accra.

The closing date for the receipt of quotations will be 10 July, 1961. (B 15)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD
Distribution Transformers for Disposal

THE Board have for disposal, and invite tenders for, the purchase and removal of 73 transformers ranging from 5 to 562·5 kVA, 34 of which are serviceable as taken out of commission.

Further details, full particulars as to where they may be inspected, and Forms of Tender on which offers must be submitted may be obtained from the Manager, No. 4 Sub-Area, Merseyside and North Wales Electricity Board, Rhostyllen, Wrexham, Denbighshire.

Tenders must be returned in a sealed envelope as provided so as to arrive not later than noon on Wednesday, 21 June, 1961.

The transformers are offered for sale without guarantee as to their condition, and the Board do not bind themselves to accept the highest or any tender and reserve the right to accept the whole or any part of any tender.

M. M. PARKER,
Secretary.
(B 73)

TENDER

Tenders are invited for the supply of:

SWITCHGEAR AND STRUCTURES, ETC., FOR THE ERECTION OF OUR 33 kV POINT FORTIN SUB-STATION.

Specifications may be obtained on writing to the Purchasing Officer, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port-of-Spain, Trinidad, W.I.

Closing date for Tenders: Monday, 31 July, 1961. (B 72)

CITY OF MANCHESTER
Handforth Overspill Site

TENDERS are invited for the supply of approximately

(a) 206 sodium lanterns with control gear (General Electric Co. Ltd. manufacture).

(b) 203 "Byway" and "Midway" concrete lighting columns (Concrete Utilities Ltd. manufacture).

(c) 206 Sangamo Weston Timeswitches.

Tender forms returnable by 15 June, 1961, from the City Surveyor, Town Hall, Manchester 2. (B 52)

TRINIDAD & TOBAGO ELECTRICITY COMMISSION
Port of Spain "B" Power Station

CONTRACT No. 215.
P.C.R. REF. No. 1054/1010.

TENDERS are invited for the supply and erection of Two 475,000 lb/hr Steam Generating Units and ancillary plant for the Port of Spain "B" Power Station

CONTRACT No. 217.
P.C.R. REF. No. 1054/1012.

Tenders are invited for the supply and erection of 33 kV Main Switchgear for the Port of Spain "B" Power Station.

Tenders are invited only from firms who are prepared to submit complete tenders for each contract.

A short précis of the extent of the works for which complete and comprehensive offers are invited may be had on application to Messrs Preece, Cardew and Rider, 8, 10 and 12 Queen Anne's Gate, London S.W.1.

Tender documents, which will be available from 5 June, 1961, and returnable by mid-day on 4 Sept., 1961, may be obtained from the same address on receipt of a payment by cheque for £15 in favour of Preece, Cardew and Rider. This payment will not be refunded.

At a later date offers will be invited for Turbo-Alternators, Transformers, Auxiliary Switchgear and Cabling. Persons interested in such should NOT now apply, but await further advertisements.

The Trinidad and Tobago Electricity Commission do not bind themselves to accept the lowest or any tender, nor will they be responsible for any costs incurred by tenderers on making their tender.

(B 51)

APPOINTMENTS VACANT

SOUTH WESTERN ELECTRICITY BOARD
FIRST ASSISTANT DISTRICT ENGINEER (PLANNING)
EXETER

SALARY within Class G, Grade 5, Salary Scale 11, £1,275/£1,410 per annum, of the N.J.B. Agreement.

The person appointed will be responsible to the District Engineer for all aspects of planning, including the preparation of schemes and estimates for the extension and reinforcement of the distribution systems, both overhead and underground, up to 33 kV. He may also be required to undertake standby duties.

Candidates should have a wide experience of planning construction and operation of urban and rural distribution systems, and a knowledge of budget preparation and long term forecasting. Qualifications equivalent to Corporate Membership of the Institution of Electrical Engineers are most desirable, and the possession of a current driving licence will be an advantage.

Applications to be made on Standard Form AE6/ACT, OBTAINABLE BY POST-CARD ONLY from the District Manager, South Western Electricity Board, 3 Bedford Street, Exeter. Closing date for receipt of completed applications is 17 June, 1961. (B 66)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

MINISTRY OF WORKS

TECHNICAL CLASS

PENSIONABLE posts for men (and women for posts (v)) with qualifications as below. Age on 1 March, 1961, at least 28 for posts (i), and 25 for other posts.

(i) CLERKS OF WORKS (BUILDING)

Eight posts. O.N.C. in Building, or equivalent qualification; apprenticeship as craftsman, or at least three years' full-time (or five years' part-time) training, or at least three years as journeyman or in a builder's general office, followed by not less than five years' experience in building, including three years as a site or general foreman or clerk of works.

(ii) SUPERVISING ENGINEERS

Nine posts. O.N.C. in electrical and/or mechanical engineering, or technical education to that standard. Five years' apprenticeship or equivalent training essential, followed by at least three years' comprehensive engineering experience or service as supervisor or technical assistant.

(iii) FOREMEN (BUILDING)

Twelve posts. O.N.C. in Building, or equivalent qualification; apprenticeship in a building trade, followed by at least three years' experience as foreman or chargehand, either on general building construction and maintenance, or on the preservation and restoration of ancient and historic structures.

(iv) CIVIL ENGINEERING INSPECTORS

Two posts. At least seven years' general civil engineering experience, including at least three years in a supervisory capacity. Ability to supervise and set out work in the following fields essential: reinforced concrete of moderate scope; foundations of normal type; deep sewers or sewers as on housing sites; sewage disposal works; concrete and tarmacadam roads. O.N.C. in Building, or equivalent, an advantage.

(v) TECHNICAL ASSISTANTS

Three posts (to assist Architects and Maintenance Surveyors). O.N.C. or equivalent in Building, or technical education to that standard, together with at least five years' technical experience with an architect, building surveyor, or building contractor.

National salary: £801 (at 25) to £884 (at 28 or over), rising to £988. Promotion prospects. Write Civil Service Commission, 17 North Audley St, London W.1, for application form, quoting S/5312/61. Closing date: 29 June, 1961. (B 49)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Project Group

HINKLEY POINT NUCLEAR POWER STATION

APPLICATIONS are invited from suitably qualified engineers for the post of

SECOND ASSISTANT ENGINEER (MECHANICAL)

at Hinkley Point Nuclear Power Station Construction Site.

The successful candidate will be required to assist the Site Mechanical Engineer in the supervision of the installation and testing of mechanical engineering plant—conventional and nuclear.

Applicants should preferably be members of an appropriate professional institution or possess qualifications leading to membership, and have served a recognised engineering apprenticeship. Experience on power station equipment either in a manufacturer's works or on site is a necessary qualification.

The salary will be within Scale 15 of the National Joint Board Agreement, i.e., £1,400/£1,830 per annum, according to qualifications and experience.

Applications stating age, qualifications, experience, present position and salary, should be forwarded to the Administrative Officer, Central Electricity Generating Board, Southern Project Group, Squires La, Finchley, N.3, to arrive not later than 15 June, 1961.

Envelopes should be marked "Confidential—ref.: S/61/9."

T. YULE,
Chief Project Engineer.
(B 34)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

APPLICATIONS are invited for the appointment of

SECOND ASSISTANT STATION CHEMIST

at Elland Power Station.

Applicants must have a Higher National Certificate in Chemistry and have had previous Power Station experience. A knowledge of the operation of modern water treatment plants would be considered advantageous.

The conditions of service and salary will be in accordance with the National Joint Board Agreement, Grade 11, Class H, Schedule A (£890/£1,015 per annum).

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than the 17 June, 1961. (B 58)

AIR MINISTRY

REQUIRES

(a) EXAMINERS
(TECH. CLASS GRADE III)

in the Aeronautical Inspection Service, mechanical, explosives, electrical and radio trades. **Duties:** Periodical inspection and testing of aircraft, accessories and components, M.T., radio, electrical, tools, ground equipment, ammunition and explosive stores. At Henlow only calibration of radio test equipments. **Location:** Vacancies are likely to arise at Carlisle, Heywood, Stafford, Hartlebury, St. Athan (S. Wales) and Gloucester/Wiltshire area; also at Fauld and Chilmark, explosives trade only, Sealand and Henlow radio only, and Aldergrove (N.I.) mechanical only. Applicants must be prepared to serve a tour(s) overseas.

(b) TECHNICAL CLASS GRADE III
RADIO SIGNALS COMMAND

Duties: Assistance in the design and evaluation of radio communications, radio navigation and radar systems or assistance in the maintenance and modification of equipment in a Radio Telegraph Station. **Location:** Near Marlow, St. Lawrence, I.o.W., Cheadle, and vacancies may arise later in the year at Tangmere, Watton and Norton.

Quals.: Full apprenticeship or equiv. training, plus O.N.C. or C. and G. Inter or Technicians cert. or equiv. qualn. Applications considered from those taking the final year of these certs in 1961. Appointments will be unestablished but opportunities for permanent appointments are likely to arise. **Salary scale:** £827/£988; age 28 and over start at £884. Prospects of promotion to higher ranks with max. of £1,747. Applications and further details from Air Ministry C.E.3f, London W.C.1, or any Employment Exchange, quoting for post (a) City O/N 16 and post (b) City O/N 1134. (B 40)

SARAWAK

Public Works Department

GOVERNMENT ELECTRICAL ENGINEER

DUTIES: Design, estimation and specification of Government electrical projects. Supervision of new and maintenance contract work, and advising Government Departments generally on electrical problems.

Qualifications: Candidates (preferably over 35 years) must possess Corporate Membership of Institution of Electrical Engineers and wide experience in design and estimation of electrical installations. They must also have administrative ability to organise work of a small Headquarters Electrical Branch.

Terms of Appointment: On contract for one tour of three years with salary at appropriate point in scale £1,386/£2,324. Gratuity payable. Free passages. Child education and outfit allowances. Government quarters at low rental. Generous leave.

Write Director of Recruitment, Colonial Office, London S.W.1, quoting BCD 112/24/07/D10, giving full names, age, qualifications and experience. (B 37)

KENT EDUCATION COMMITTEE

Maidstone Technical College

WANTED for 1 Sept., 1961, or as soon as possible thereafter

LECTURER IN ELECTRICAL ENGINEERING

Salary Burnham Scale, £1,370/£1,550. Starting salary dependent upon appropriate experience.

Forms of application and further particulars obtainable from the Principal, Technical College, Tonbridge Rd, Maidstone, to whom completed applications should be returned by 16 June, 1961. (B 53)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applicants should state age, qualifications, experience, etc., and quote the appropriate Vacancy Number.

Coventry Sub-Area

THIRD ASSISTANT ENGINEER (CONSTRUCTION)
Vacancy No. 57/61.

Salary: N.J.B. Class L, Grade 11, £1,115/£1,245 per annum.

The duties will include the preparation of estimates, bills of quantities, examination of tenders and contractors' accounts for civil engineering and building work associated with the construction of substations, offices, workshops, etc., in Coventry and District.

Applicants should hold a current driving licence.

THREE SECOND ASSISTANT DISTRICT ENGINEERS
Vacancy No. 58/61.

Salary: N.J.B. Class G, Grade 7, £1,115/£1,245 per annum.

The duties will be to assist in the construction, operation and maintenance of underground and overhead H.V. and L.V. distribution systems.

Candidates will be required to reside in or near the City of Coventry and to undertake standby duty.

FOURTH ASSISTANT ENGINEER (METERS)
Vacancy No. 59/61.

Salary: N.J.B. Class L, Grade 12, £1,040/£1,165 per annum.

Candidates should have had a sound technical training and experience in testing L.V. and H.V. industrial meters, kVA demand and summation equipment.

SENIOR ASSISTANT (INCOME—POST-BILLING)
Vacancy No. 60/61.

Salary: N.J.C. Grade 4, £890/£1,010 per annum.

The successful candidate will be responsible to the Principal Assistant (Income) for:

(a) Debtors' control for certain classes of accounts.
(b) The follow-up and collection of arrears of all classes of accounts, including necessary Court action and liquidation and bankruptcy proceedings.
(c) The organisation of outside collecting staff.
(d) Initial preparation of lists of bad and doubtful debts.
(e) Responsibility for credit status records.

Applications for the above vacancies should be addressed to The Manager, Coventry Sub-Area, Sandy La, Coventry, Warwickshire, by 16 June, 1961. (B 50)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS invited for

GENERAL ASSISTANT ENGINEER (CONSTRUCTION)

at Aberdeen. Salary: £715/£870 (N.J.B. H.14/13, Scale 3/4). Superannuable position. Technical qualifications to H.N.C. level preferable. Some knowledge of the Electricity Supply Industry in connection with distribution construction work desirable.

Application forms, obtainable from the Area Manager, Millburn St, Aberdeen, should be returned not later than 14 June, 1961. (B 47)

YORKSHIRE ELECTRICITY BOARD

Head Office

SECOND ASSISTANT ENGINEER
(SYSTEM DESIGN)

APPLICANTS should have considerable experience in the planning, construction and operation of distribution systems working at 11 kV and lower voltages in urban and rural areas. Experience of 66 kV, 33 kV or lower voltage systems supplying heavy industrial loads is desirable.

Salary: N.J.B. Class BX, Grade 5 (transitional to Scale 14), £1,375/£1,720 per annum.

Applications, together with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Head Office, Wetherby Rd, Scarcroft, Leeds, not later than 12 June, 1961.

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Applicants should have had experience in the operation of 33 kV and 11 kV switchgear. The successful candidate will be required to take part in a five-man rota of shift duties covering the Sheffield City network.

Salary: N.J.B. Class N, Grade 13 (Scale 9), plus 10% shift enhancement, £1,226 10s/£1,369 10s per annum.

GENERAL ASSISTANT ENGINEER
(CIVIL ENGINEERING DRAUGHTSMAN)

Applicants should have had experience in the preparation of plans and detailed drawings of buildings and civil engineering works including substations up to 66 kV.

Salary: N.J.B. Class N, Grade 14 (Scale 8), £1,040/£1,165 per annum.

ECCLESFIELD DISTRICT
SECOND ASSISTANT DISTRICT ENGINEER

Applicants should be experienced in the working of a District Engineering Department. Experience in the operation, maintenance and construction of substation and mains, both overhead and underground, and in the planning and estimating of development schemes on an electricity distribution system with voltages up to 66 kV, will be an advantage.

Salary: N.J.B. Class G, Grade 7 (Scale 9), £1,115/£1,245 per annum.

SHEFFIELD WEST DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

Applicants should have had experience in the work of a District Engineering Department, including construction, operation, maintenance and planning.

Salary: N.J.B. Class J, Grade 9 (Scale 9), £1,115/£1,245 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 3 (Sheffield) Sub-Area, Commercial St, Sheffield 1, not later than 16 June, 1961. (B 68)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified engineers for the following appointments which are subject to the conditions of the National Joint Board.

Wear Sub-Area

THIRD ASSISTANT ENGINEER
SUB-AREA ENGINEER'S STAFF
OPERATION AND MAINTENANCE SECTION
SUNDERLAND

The successful applicant will be required to assist with the operation and maintenance of H.V. and L.V., overhead and underground distribution networks and substations, up to and including 66 kV.

Salary: Schedule A, Class L, within Grades 10-11, £1,115/£1,325 per annum.

It is not necessary for applicants to previous advertisements for above appointment to re-apply.

Tees Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
DARLINGTON

Salary: Schedule A, Class G, Grade 7, £1,115/£1,245 per annum.

SECOND ASSISTANT DISTRICT ENGINEER
MIDDLESBROUGH

Salary: Schedule A, Class G, Grade 7, £1,115/£1,245 per annum.

Applicants for the above appointments

continued in next column

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should have experience in the design, construction, operation and maintenance of H.V. and L.V., overhead and underground distribution systems in urban and rural areas, substation plant and ancillary equipment.

It is not necessary for applicants to previous advertisements for above appointments to re-apply.

ASSISTANT DISTRICT COMMERCIAL ENGINEER
MIDDLESBROUGH
(CONTRACTING AND CONSUMER SERVICE SECTION)

Applicants should have experience in estimating electrical installation work and the preparation of specifications. A sound knowledge of installation practice, electrical apparatus repairs and good commercial ability are necessary.

Salary: Schedule A, Class G, Grade 9, £965/£1,090 per annum.

ASSISTANT DISTRICT COMMERCIAL ENGINEER
MIDDLESBROUGH

Applicants should have experience in the utilisation of electrical energy in domestic and commercial premises, a knowledge of installation work and be conversant with tariffs, sales and all aspects of consumer service.

Salary: Schedule A, Class G, Grade 9, £965/£1,090 per annum.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne 1, within ten days of the appearance of this advertisement. (B 65)

AIR MINISTRY

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS

FOR design construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil Airports.

SALARY according to age, quals. and exp. from £936 (at 25) to £1,430 max., with increase for London and slight decrease in country districts. In addition salary is increased by £75 p.a. (within the maximum of scale) after two years' approved service, subject to being corporate members of Institution of Mechanical or Electrical Engineers. Appointments long term with good prospects of pension and advancement to numerous posts in higher grades, viz.:

Mechanical and Electrical Engineers: £1,456/£1,950, 125 posts;

Senior Mechanical and Electrical Engineers: £2,080/£2,392, 34 posts;

Superintending and above Mechanical and Electrical Engineers: £2,650 upwards, nine posts.

Vacancies occurring in higher grades are filled by promotion of existing staff.

Good opportunities for acquiring exp. overseas where special allowances ranging at present up to £1,800 p.a., according to location and marital status, are payable in addition to higher salary. Five-day week with four weeks' two days' paid leave p.a. initially.

QUALS.: (a) University degree or equiv. diploma in electrical and/or mechanical engineering with at least two years' apprenticeship; or (b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship; or (c) Graduate or corporate member of I.Mech.E. appreciable electrical engineering exp. with at least three years' apprenticeship. In addition, all candidates should have been employed for min. of two years with well-established engineering concern and gained wide exp. in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages 25 and 35. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D 128/1A. Selection will be by interview in London and certain expenses will be reimbursed. (B 22)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applicants should state age, qualifications, experience, etc., and quote the appropriate Vacancy Number.

Lincolnshire Sub-Area

Re-Advertised Vacancy No. 28/61.
THIRD ASSISTANT DISTRICT ENGINEER
LINCOLN DISTRICT

Salary: N.J.B. Class G, Grade 9, £965/£1,090 per annum.

The duties of the post will be to assist in the planning, construction, operation and maintenance of underground and overhead systems up to and including 11 kV.

The successful candidate will be required to reside in or near the City of Lincoln and to undertake standby duty.

Applications should be forwarded to the Manager, Lincolnshire Sub-Area, North Hse, Grantham, Lincolnshire, by 16 June, 1961.

Northamptonshire Sub-Area

Vacancy No. 61/61.
SENIOR ASSISTANT
(WAGES, SALARIES AND SUPERANNUATION)

Salary: N.J.C. Grade 5, £1,020 x £30—£1,140 per annum.

The successful applicant will be responsible for weekly and monthly payrolls, P.A.Y.E. tax returns, National Insurance procedure (including graduated pensions) and the maintenance of superannuation records.

A good knowledge of the N.J.B., N.J.C. and N.J.I.C. rates of pay and conditions of service is required and the successful applicant should be fully conversant with the Superannuation Schemes adopted by the Board.

The possession of a qualification would be an advantage.

Applications should be forwarded to the Manager, Northamptonshire Sub-Area, 25 Bridge St, Northampton, by 16 June, 1961. (B 69)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

Vacancy Notice ET/AV/53/61.
GENERAL ASSISTANT ENGINEER
(OPERATION)

REQUIRED at Portishead "B" Generating Station.

Superannuation Scheme. Salary: N.J.B. Class K, Grade 13, Scale 6, £890/£1,015 p.a., plus 10% shift enhancement (minimum £90).

Candidates should preferably hold, or be studying for, a Higher National Certificate or similar qualification.

Closing date: 12 June, 1961.

Vacancy Notice ET/AV/54/61.
GENERAL ASSISTANT ENGINEER
(EFFICIENCY)

Required at Castle Meads Power Station, Gloucester.

Superannuation Scheme. Salary: N.J.B. Class E, Grade 11, Scale 3, £715/£805 per annum.

Duties will be of a general engineering nature in connection with efficiency, instrumentation and technical records. Applicants should preferably possess a Higher National Certificate.

Closing date: 6 June, 1961.

Vacancy Notice ET/AV/55/61.
STATION SHIFT CHARGE ENGINEER

Required at Hayle Generating Station.

Superannuation Scheme. Salary: N.J.B. Class F, Grade 7, Scale 8, £1,040/£1,165 p.a., plus 10% shift allowance.

Applicants should have had considerable experience in Power Station operation.

Graduate or Corporate Membership of a recognised Engineering Institution or equivalent desirable.

Closing date: 12 June, 1961.

Applications on Form AE6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by the date mentioned. (B 67)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER
CASTLE DONINGTON POWER STATION
Vacancy No. 105/61.

APPLICATIONS are invited for the position of Assistant Shift Charge Engineer at Castle Donington Power Station, near Derby.

Candidates should have received a thorough practical and technical training and have had experience in the operation of modern high merit plant, together with the control of staff.

Technical qualifications leading to Corporate Membership of a professional institution will be an added advantage.

Salary will be within Class L, Grade 8 £1,350/£1,500 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 9 June, 1961.

SHIFT CHARGE ENGINEER
WARWICK POWER STATION
Vacancy No. 115/61.

Applications are invited from qualified engineers for the position of Shift Charge Engineer at Warwick Power Station, Emscote, Warwick.

Applicants should have had experience in the operation of steam turbine and boiler plant.

Salary will be in accordance with Class E, Grade 7 (£965/£1,090 per annum) of the National Joint Board Agreement plus 10% allowance for shift duties.

Closing date for receipt of applications: 16 June, 1961

ASSISTANT SHIFT CHARGE ENGINEER
STAYTHORPE "A" POWER STATION
Vacancy No. 124/61.

Applications are invited from qualified engineers for the position of Assistant Shift Charge Engineer at Staythorpe "A" Power Station, nr. Newark, Notts.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class K, Grade 8 (£1,275/£1,410 per annum) of the National Joint Board Agreement plus 10% allowance for shift duties.

Closing date for receipt of applications: 16 June, 1961.

ASSISTANT ENGINEERS (CONTROL ROOM)
LEICESTER POWER STATION
Vacancy No. 125/61.

Applications are invited for the positions of Assistant Engineers (Control Room) at Leicester Power Station, Rawdykes Rd, Leicester.

Candidates for this post should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class G, Grade 13 (£715/£805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications: 16 June, 1961.

GENERAL ASSISTANT ENGINEERS
DRAKELOW "A" AND "B" POWER STATIONS
Vacancy No. 126/61.

Applications are invited for the positions of General Assistant Engineers at Drakelow "A" and "B" Power Stations, near Burton-on-Trent.

Preference will be given to candidates who hold the Higher National Certificates or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class M, Grade 16 (£825/£940 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 16 June, 1961.

STATION SHIFT CONTROL ENGINEER
COVENTRY POWER STATION
Vacancy No. 127/61.

Applications are invited for the position of Station Shift Control Engineer at Coventry Power Station, Alderman's Green, Coventry.

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Applicants should possess a sound technical training and have practical experience in the control of steam generating plant and the operation of switchgear.

Salary will be in accordance with Class G, Grade 10 (£890/£1,015 per annum) plus 10% allowance for shift duties, of the National Joint Board Agreement.

Closing date for receipt of applications: 16 June, 1961.

These appointments are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned and returned to him by the specified date.

O. S. WOODS,
Divisional Controller.
(B 71)

CENTRAL ELECTRICITY GENERATING BOARD
South Thames Division

NORTHFLEET POWER STATION
ASSISTANT ENGINEERS (SHIFT)
Vacancy No. 154/61.

THESE engineers are required for general operation duties on shift, and relevant experience within a modern Generating Station is necessary.

Salary: N.J.B. Class M, Grade 10, £1,452 10s/£1,601 per annum, including London and Shift Allowances.

Applications giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Northfleet Power Station, Crete Hall Rd, Northfleet, Kent, to arrive by 16 June. (B 63)

CENTRAL ELECTRICITY GENERATING BOARD
South Thames Division

NORTHFLEET POWER STATION
ASSISTANT ENGINEER (OPERATION)
Vacancy No. 149/61.

CANDIDATES must be prepared to do relief and shift work when required. Experience with modern generating plant would be an advantage.

Salary: N.J.B. Class M, Grade 12, £1,165/£1,295 per annum including London Allowance, plus 10% shift allowance when applicable.

Applications giving age, details of experience, qualifications, etc., should be sent to the Sation Superintendent, Northfleet Power Station, Crete Hall Rd, Northfleet, Kent, to arrive by 14 June. (B 62)

Circuit Design Engineer

required

to assist Chief Engineer in basic development of new circuits, etc., requiring new techniques.

The age bracket is not of importance but the successful applicant will be paid an excellent salary providing he can satisfy the executive of his capabilities relative to his abilities to deal with circuit problems and calculations using his initiative and experience gained in a good sphere of activity in a similar type of work.

A basic background of lift and crane control applications would be given a priority consideration.

The position would be in the London area.

Pension Fund, Canteen facilities.

Confidential replies in the first instance, giving age, experience and present salary range, should be addressed to the Personnel Officer, Box No. 8309, Electrical Times.

(B 21)

THE EAST MIDLANDS ELECTRICITY BOARD

APPOINTMENT OF CHIEF ENGINEER

THE East Midlands Electricity Board invite applications for the post of Chief Engineer to the Board to succeed Mr A. G. Connell, M.I.E.E., M.I.MECH.E., F.INST.F., on his retirement in November, 1961.

Candidates must be Corporate Members of the Institution of Electrical Engineers and should have had wide experience in a large electricity supply organisation.

The salary for the appointment will be between £4,000 and £4,750 per annum.

Applications giving full details of age, qualifications, experience, present position and salary should be forwarded to the Chairman of the Board at Mapperley Hall, Lucknow Ave, Nottingham, to arrive not later than 12 June, 1961. (B 30)

BRUSH

Brush Electrical Engineering Company Limited

(A member of the Hawker Siddeley Group—Industrial Division)

DRAUGHTSMEN

Transformer
Switchgear
Rotating Electrical Machines
Motor Control Gear
Electric and Diesel Electric Locomotives
(Mechanical, Control Gear & Electrical Machines)
General Engineering

If you are a qualified Draughtsman and interested in one of the above vacancies, please apply to:

Mr. A. Garner,
Brush Electrical Engineering Company Limited,
Loughborough, Leicestershire,

quoting reference PL.9943, and giving brief details of your qualifications and experience.

ALL APPLICATIONS WILL BE TREATED IN THE STRICTEST CONFIDENCE.

The Company is situated in a small town on the edge of Charnwood Forest. Extensive housing development is taking place and excellent educational facilities of all grades are available.

(B 25)

FULLER ELECTRIC LIMITED

Electrical Engineer

With induction heating or melting experience to handle technical and commercial aspects of this type of equipment. This position offers a young engineer an opportunity to build up his own department and there is also a possibility of visiting Sweden to further experience and knowledge in this field.

Electrical Designer

With experience or knowledge of variable speed A.C. Commutator motor design. Successful applicant will be senior member of small development and design team.

Electrical Power Engineer

Successful applicant will be responsible for technical and commercial aspects of contract for H.V. switchgear, generating equipment, protective gear and other equipment associated with power systems up to 275 kV (including the 50 cycle electrification of British Railways). An excellent opportunity for a young qualified engineer who wishes to further his experience in this field. Responsibilities will include periodic visits to site during erection and commissioning.

Applications for any of the above vacancies should give age, experience, qualifications and present salary and be made to:

Personnel Manager,
Fuller Electric Limited,
Fulbourne Road,
London, E.17.

(B 44)

ASSISTANT
ELECTRICAL TEST ENGINEER

Applications are invited from men aged 23-40 for the above post in our Electrical Test Section concerned with the testing and investigation of High Voltage Bushings and other Insulation Products.

The Test Section is closely associated with developments in the extremely high voltage field of Insulation Products and offers varied work with a high level of interest.

Training and experience in the electrical engineering field is necessary and some knowledge of High Voltage Power Supply Equipment would be helpful. A technical qualification to H.N.C. level is desirable but not essential.

The duties of the post entail a 42-hour working week in relation to Works Departments and a good commencing salary and conditions of service are offered.

Applications giving details of age, experience, qualifications and current salary, should be sent to:

Personnel Manager
THE MICANITE & INSULATORS CO. LTD.
Empire Works, Blackhorse Lane, Walthamstow, London, E.17

(B 36)

A progressive Electrical Manufacturing Co. has vacancies for the following:

(a) An experienced Design Draughtsman to develop a range of motor control equipment for medium voltage application.

(b) An experienced Design Draughtsman for development work on fuse-switchgear and who has specialised on unitised gear.

Applicants with suitable experience are invited to apply in confidence to: Box No. 8317, Electrical Times.

(B 54)

BRITISH JEFFREY-DIAMOND LTD., STENNARD WORKS, WAKEFIELD,

require the services of an experienced

A.C. MOTOR DESIGNER

for heavy-duty motors for use in the mining industry. Both electrical and mechanical design is involved and this senior position offers interesting possibilities in an established and expanding organisation.

Apply, in writing, to the Secretary, stating age, experience and qualifications.

(B 43)

N.I.R.N.S. NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

have the following vacancies at the Rutherford High Energy Laboratory now under construction adjacent to the Atomic Energy Research Establishment at Harwell, Berks.

ELECTRICAL DESIGN ENGINEERS AND DRAUGHTSMEN are required for the development of circuits and the specification of plant and equipment associated with particle accelerators. A sound basic training in electrical engineering is required and for the higher posts a knowledge of modern techniques concerning control and instrumentation such as solid state devices and magnetic amplifiers or servo mechanisms with electronic control for high stability. The work covers a wide technical field and involves close liaison with scientific staff developing a variety of experimental apparatus, but previous experience of nuclear work is not essential for these posts.

ENGINEER (Ref. V.N. 51/49) A Design Engineer with experience of circuit design to take responsibility for the design and specification of control systems for various projects. A good degree in electrical engineering or corporate membership of the Institution of Electrical Engineers is essential. A good analytical background with experience in the solution of control problems using computer methods would be an advantage. The salary of the post is £1,560/£2,090 with annual increments to the maximum of the scale. A candidate may however be appointed at a point above the minimum of the scale.

ENGINEER (Ref. V.N. 52/49) Assistant Design Engineers with good experience of electrical design work. A Higher National Certificate in electrical or electronic engineering is required. The starting salary will be in the scale £1,065/£1,535 according to age and experience with annual increments to the maximum of the scale.

DRAUGHTSMEN (Ref. V.N. 53/49) To work in an electrical design office on detailed drawing and layouts of a general nature and the maintenance of record drawings. An appropriate Ordinary National Certificate together with a few years' workshop experience and some drawing office experience is required. The starting salary will be in the scale £650/£1,065, according to age and experience with annual increments to the maximum of the scale.

Opportunities occur for advancement to higher posts. There is a contributory superannuation scheme, transport facilities are available and assistance is given with housing. If you are interested then please send a postcard for further details to:

Personnel Officer
Rutherford High Energy Laboratory, Harwell, Berkshire
quoting the appropriate reference number.

(B 42)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

North Staffordshire Area:
THIRD ASSISTANT DISTRICT ENGINEER (NEWCASTLE)

Duties include the construction, operation and maintenance of H.V. and M.V. mains and substations, and applicants should have had experience in the planning of system reinforcements and mains extensions. Salary: £890/£1,015 per annum (N.J.B. Grade F.9). Apply, by letter, within ten days, stating age, experience, present position and salary, to Mr C. C. Pimble, Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

Wolverhampton Area
THIRD ASSISTANT DISTRICT ENGINEER (WALSALL)

Experience necessary in construction, operation and maintenance of underground distribution systems, knowledge of overhead distribution systems also an advantage. Technical qualifications desirable. Salary: £965/£1,090 per annum (N.J.B. Grade G.9). (It is probable that the District will shortly be reclassified to Class H.) Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr D. Holt, Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

F. W. CATER,
Secretary.
(B 48)

ADMINISTRATIVE COUNTY OF LEICESTER
ASSISTANT ELECTRICAL ENGINEER
£960/£1,310

CANDIDATES must be Associate Members of the Institution of Electrical Engineers or be in possession of the Higher National Certificate and be experienced in the design of electrical installations for all types of buildings. Removal expenses and lodging allowance may be paid to a married man. Apply on form available from the County Architect, 123 London Rd, Leicester.
(B 10)

PIRELLI – GENERAL CABLE WORKS LTD

Wish to appoint a

PRODUCTION ASSISTANT

in the Power Cable Department at the Eastleigh Factory.

Initially the responsibilities will be concerned with the control of a new oil-filled cable impregnating plant. Later the successful candidate will be required to assist in the broader responsibilities of the manufacture of power cables up to the highest voltages.

Candidates should be in the age range 23/40 and should have either a degree in Physics or Electrical Engineering, or should have a Higher National Certificate which includes these subjects.

Letters of application should be addressed to the

Personnel Manager,
Pirelli-General Cable Works Ltd.,
Southampton.

(B 38)

Electrical Engineer

THE NORTH BRITISH RUBBER COMPANY requires an Electrical Engineer, aged 30-40, to take charge of the Department and be responsible to the Chief Engineer for the supply, application and maintenance of all electrical plant (5,000 kVA). Candidates must have served apprenticeship and have at least five years' experience in a factory, including supervision of labour and selection and installation of plant. A generous salary will be offered to the selected candidate, who must possess at least H.N.C. in Electrical Engineering.

The Company operates a contributory superannuation scheme and provides free life assurance. Assistance will be given with removal expenses. Applications, giving full particulars and present salary, should be addressed to Industrial Relations Division, THE NORTH BRITISH RUBBER CO. LTD., P.O. Box 47, Castle Mills, Edinburgh, 3 (B 56)

SOUTH EASTERN ELECTRICITY BOARD
SENIOR DEMONSTRATOR
DORKING AND EPSOM DISTRICT

SALARY within the range £700 x £25—£775 per annum under N.J.C. Grade 2. Superannuable. Applicants should hold a recognised qualification in domestic science and the E.A.W. Certificate and be prepared to work anywhere in the Dorking and Epsom District. They should be experienced in giving talks and demonstrations on all types of domestic apparatus and will be required to assist in training and in general showroom work.

Applications, quoting ET, on forms from District Manager, Seeboard, 56 South St, Dorking, by 14 June, 1961.

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER
CROYDON AND PURLEY DISTRICT

Salary £1,500/£1,670 per annum including London Allowance under N.J.B. Class J, Grade 5, with progression to Grade 4 (maximum salary £1,780) subject to satisfactory service. Superannuable. The successful applicant will be responsible to the District Commercial Engineer for supply and tariff negotiations, sales activities, contracting and general development. Candidates should be suitably qualified and widely experienced in the commercial side of the industry. They should also be capable of promoting a progressive commercial development policy.

Applications, quoting ET and naming two referees, on forms from District Manager, Seeboard, Electric Hse, Wellesley Rd, Croydon, by 14 June, 1961.

SENIOR SHOWROOM ASSISTANT (MALE)
CROYDON AND PURLEY DISTRICT

Salary £640 x £25—£740 p.a. including London Allowance under N.J.C. Grade 1. Superannuable. Applicants should have good knowledge of showroom procedure, be conversant with tariffs, able to arrange displays and promote sales. The appointment is for Shirley showroom, but the successful applicant must be prepared to work in any other showroom of the Croydon and Purley District. Possession of the E.D.A. salesmanship certificate an advantage.

Applications, quoting ET and naming two referees, on forms from District Manager, Seeboard, Electric Hse, Wellesley Rd, Croydon, by 14 June, 1961.

FITTER (ELECTRICAL)
WORTHING DISTRICT

Wages 5s 6½d per hour for 42-hour 5-day week, under N.J.I.C. Agreement. Applicants should be experienced in the maintenance, erection, panel wiring, etc., of high voltage switchgear, transformers and substation ancillary equipment.

Applications, quoting ET and naming two referees, to District Manager, Seeboard, 56 Chapel Rd, Worthing, by 12 June, 1961.

GEORGE WRAY,
Secretary.
(B 70)

LIBYAN ELECTRICITY CORPORATION

AN oil-fired steam power station of 20,000 kW capacity now being constructed in Tripoli for the Libyan Electricity Corporation will come into commission Sept., 1961. Applications invited for the following posts on contracts from two to four years:

SUPERINTENDENT AND
ASSISTANT SUPERINTENDENT
OF THE POWER STATION
ELECTRICAL/MECHANICAL
MAINTENANCE ENGINEER
THREE SHIFT-CHARGE ENGINEERS
THREE ASSISTANT SHIFT-CHARGE ENGINEERS
ONE TURBINE HOUSE FOREMAN
ONE BOILER HOUSE FOREMAN

Salaries will vary from £2,400 per annum for the Superintendent to £1,200 per annum for the Boiler and Turbine House Foremen.

Free accommodation or 12% allowance in lieu.

Gratuity of one month's salary per year of service paid at end of contract.

Local tax 8%. No U.K. tax.

Free medical treatment. Return passages for employee and family.

Leave 18/24 days per annum may be accrued up to two years with leave passage paid to U.K.

Apply in writing to Room 103, Foreign Office, London S.W.1. Completed application forms should be received three weeks from this date. (B 57)

CENTRAL ELECTRICITY GENERATING BOARD
South Wales Division
Re-Advertisement
Vacancy No. 116/ET/61.

APPLICATIONS are invited for the superannuable N.J.B. appointment of
ASSISTANT MAINTENANCE ENGINEER (MECHANICAL)
CARDIFF POWER STATION

Salary: Schedule A, Class F, Grade 8, Scale 7, £965/£1,090 per annum.

Applicants should have had experience in the maintenance of heavy plant and possess H.N.C. or equivalent qualifications.

Previous applicants need not re-apply.

Special application forms obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 16 June, 1961. (B 61)

DEWHURST & PARTNER LIMITED
TECHNICAL SALES ENGINEERS

Due to expansion programme, coupled with the promotion of existing staff, the following additional staff appointments will shortly be made:

(a) Resident Engineer and Sales Manager (Western Counties).

(b) Senior Technical Representatives Manager (Western Counties).

(c) Junior Technical Representatives (Midland Counties).

All applicants must have manufacturing knowledge of automatic motor control equipment, coupled with technical background in this field. Applicants for positions (a) and (b) must have proven sales experience, and record with companies manufacturing similar types of equipment. All appointments are pensionable under the company pension fund, and in the case of positions (a) and (b) a Company car will be provided.

Confidential applications in writing in the first instance giving age, experience, qualifications and salary required, to the Personnel Officer, Dewhurst and Partner Ltd., Inverness Wks, Hounslow, Middx, stating position for which application is made.

(B 20)

EASTERN ELECTRICITY BOARD

Fens Sub-Area

TWO GENERAL ASSISTANT ENGINEERS
(OPERATION AND MAINTENANCE)
133/61.R.

THE posts offer excellent opportunities for young men to gain experience in the operation and maintenance of 33 kV, 11 kV and L.V. systems in a predominantly rural area.

Applicants should have had sound technical training, the posts being particularly suitable to candidates who have recently completed their training and are seeking to broaden their experience.

Salary: N.J.B. (1) Class K, Grade 14 (£825/£940); (2) Class K, Grade 15 (£765/£870).

Apply by letter to the Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 16 June, 1961.

Northmet Sub-Area

DEVELOPMENT SECTION
SUB-AREA HEADQUARTERS
FOURTH ASSISTANT ENGINEER
128/61.R. (Ref. 1066)

Candidates should possess the Higher National Certificate in Electrical Engineering or an equivalent qualification, and should have had some experience of the construction, operation and maintenance of distribution equipment.

The duties will include the preparation and technical assessment of reinforcement and development schemes for the Sub-Area H.V. and L.V. systems, assistance with the capital programme, the examination of load flow diagrams and estimation of future trends, and the preparation of schemes for long-term reinforcement.

Salary: N.J.B. Class N, Grade 13 (£1,115/£1,245), plus London Allowance.

Apply by letter to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Southgate, London N.14, by 12 June, 1961.

Northmet Sub-Area

(a) THIRD ASSISTANT ENGINEER
HORNSEY DISTRICT
130/61.R. (Ref. 1026)

(b) THIRD ASSISTANT ENGINEER
STEVENAGE DISTRICT
131/61.R. (Ref. 1030)

(c) FOURTH ASSISTANT ENGINEER
EDMONTON DISTRICT
129/61.R. (Ref. 1067)

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary:

(a) N.J.B. Class G, Grade 9, £965/£1,090 plus London Allowance.

(b) N.J.B. Class G, Grade 9, £965/£1,090.

(c) N.J.B. Class F, Grade 11, £765/£870 plus London Allowance.

Apply by letter, by 12 June, 1961, as follows:

(a) to C. Bradley, M.I.E.E., Manager, Eastern Electricity Board, The Broadway, Crouch End, London N.8.

(b) to H. L. Sumner, Manager, Eastern Electricity Board, Walkern Rd, Stevenage, Herts.

(c) to C. A. Baker, B.SC.(ENG.) LOND., M.I.E.E., Manager, Eastern Electricity Board, 305 Fore St, Edmonton. (B 64)

ADMIRALTY

Navy Works Department

VACANCIES FOR MAIN GRADE MECHANICAL ENGINEERS AND FOR BASIC GRADE MECHANICAL AND ELECTRICAL ENGINEERS

VACANCIES exist in the Navy Works Department at Pinner (Middx) for Main Grade Mechanical Engineers, and at Pinner (Middx) and certain provincial centres for Basic Grade Electrical and Mechanical Engineers. Applications only considered from Corporate Members of the Institution of Mechanical Engineers or the Institution of Electrical Engineers.

Duties of main and basic grade Mechanical Engineers comprise design and super-

continued in next column

continued from previous column

vision of mechanical services in Admiralty Shore Establishments (except the Royal Dockyards), such as heating, ventilating, air conditioning, cranes, machine tools, civil engineering plant, etc. Candidates should have experience in this or similar work and for Main Grade posts be at least 32 years of age.

Duties of basic grade Electrical Engineers comprise design and supervision of electrical services in Admiralty Shore Establishments (except the Royal Dockyards), such as power and lighting installations, public address, sound reproduction, fire alarm, intercom and lightning conductor equipment.

Salary for Main Grade Engineers in range £1,506/£2,010 (London rate) and for Basic Grade Engineers: £936 at age 25 to £1,258 at 34 or over. Max. £1,430 (National rate), which varies slightly up or down according to location.

Appointments temporary in first instance, but there may be opportunities later for establishment. Prospects of promotion and opportunities may arise for service overseas.

Application to Director General, Navy Works, Admiralty, Chamberlain Way, Pinner, Middx, quoting "Staff/45.96.116." (B 31)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

APPLICATIONS are invited for the under-mentioned appointment:

THIRD ASSISTANT ENGINEER (PLANNING)

Applicants should have had a sound technical education and have obtained a Higher National Certificate or Engineering Degree. Preference will be given to Graduate or Corporate Members of the Institution of Electrical Engineers.

Applicants should preferably have had some experience in city and rural distribution planning up to 11 kV. Duties will include planning of H.V. and L.V. reinforcements and distribution to new high density housing and city redevelopment works.

Salary will be in accordance with National Joint Board Agreement, Schedule A, Class J, Grade 9, £1,115/£1,245 (Scale 9).

Applications should be on the standard application form obtainable from the Area Manager, Dundee Area, 7 Dudhope Crescent Rd, Dundee, and should be returned by 19 June, 1961. (B 46)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region
North Thames Division

APPLICATIONS are invited for the following appointments:

GENERAL ASSISTANT ENGINEER
SOUTH DENES (GT. YARMOUTH)
GENERATING STATION
(S.V. No. 1505.)

Salary: N.J.B. Class J, within the range of Grades 17-15, £625/£805 per annum.

GENERAL ASSISTANT ENGINEER
GOLDINGTON GENERATING STATION
(BEDFORD)
(S.V. No. 1506.)

Salary: N.J.B. Class H, within the range of Grades 16-14, £625/£805 per annum, plus £90 per annum Shift Allowance whilst engaged on shift duties.

Duties include assisting in the Electrical Control Room and experience in the technical operation of electrical, boiler house, and turbine house plant, testing, etc., in a Generating Station and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a Generating Staton and/or technical training to the standard of Ordinary National Certificate or its equivalent will be of advantage.

Applications, quoting the appropriate Ref. S.V. No., stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts., by 10 June, 1961. (B 33)

AUTOMATIC Electrical Control Gear manufacturers require SENIOR and JUNIOR SALES ENGINEERS for London office. Applicants for Senior positions must have Sales experience. Junior Engineers will receive training as internal, then external Sales Engineers on progressive basis. Minimum desirable qualification H.N.C. (Elec.), but those studying for this will be considered. Apply: General Sales Manager, Lee Guinness Ltd., 25 Victoria St, S.W.1. (B 14)

CABLE JOINTERS required up to and including 33 kV. Good working conditions. Apply Box No. 8303, Electrical Times. (B 17)

CABLE ESTIMATOR required. State age and experience.—Wandleside Cable Works Ltd., 106 Garratt La, Wandsworth, S.W.18. (B 28)

DRAUGHTSMEN required having experience of a.c. and d.c. L.T. switchgear for marine and industrial use. O.N.C. minimum. Contributory pension scheme in operation. Apply in writing only, stating age, experience and present salary, to the Chief Draughtsman, Whipp and Bourne Ltd., Castleton, Rochdale. (B 26)

ELECTRICAL ENGINEERS required for Manchester and Midlands Area, with experience in all types of cable installations, End Equipment, etc. Good salary and prospects. Superannuation Scheme. Apply Box No. 8301, Electrical Times. (B 16)

ELECTRICAL SENIOR and JUNIOR ESTIMATING ENGINEERS. First-class situations open, large Electrical Company, London. Write age, experience, salary. Box No. 8305, Electrical Times. (B 18)

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ASSISTANT MECHANICAL ENGINEER. Salary range: £600/£1,000 per annum.

MECHANICAL ENGINEER. Salary range: £1,000/£1,500 per annum.

Duties include the design of either electrical or heating, ventilating and mechanical services in buildings and the point of entry to salary scales is dependent on age and experience. Proved ability will be further rewarded. Luncheon vouchers and annual bonus in addition to salary. A profit sharing scheme is being evolved for Assistants and Engineers, with a superannuation scheme for Engineers only. Similar vacancies exist at our branch office in the Waterloo area. Write or telephone Steensen, Varming and Mulcahy, 146 New Cavendish St, London W.1. LANgham 6832. (B 27)

ELECTRICAL DRAUGHTSMAN required by the Guest Keen Iron and Steel Works (Branch of G.K.N. Steel Co. Ltd.), aged 25-30. Applicants should be of H.N.C. standard and have a knowledge of heavy industrial plant. Salary dependent on age and experience. Superannuation scheme, canteen and sports club facilities. Applications in writing to the Labour Manager, Guest Keen Iron and Steel Works, East Moors, Cardiff. (B 35)

ELECTRICAL ARMATURE WINDER and GENERAL ELECTRICIAN required for British Marine Repair Organisation in the Middle East.

Applicant should be capable of setting up his own electrical motor and armature rewind and repair organisation and supervise servicing of all classes of ship's electrical installations mainly direct current.

Applicants should be about 25-30 years of age and hold technical qualifications equivalent to Ordinary National Certificate.

Salary in accordance with qualifications, but not less than £1,200 per year, tax free, plus free furnished accommodation and family allowances.

Apply in writing to Box No. 8315, Electrical Times. (B 39)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

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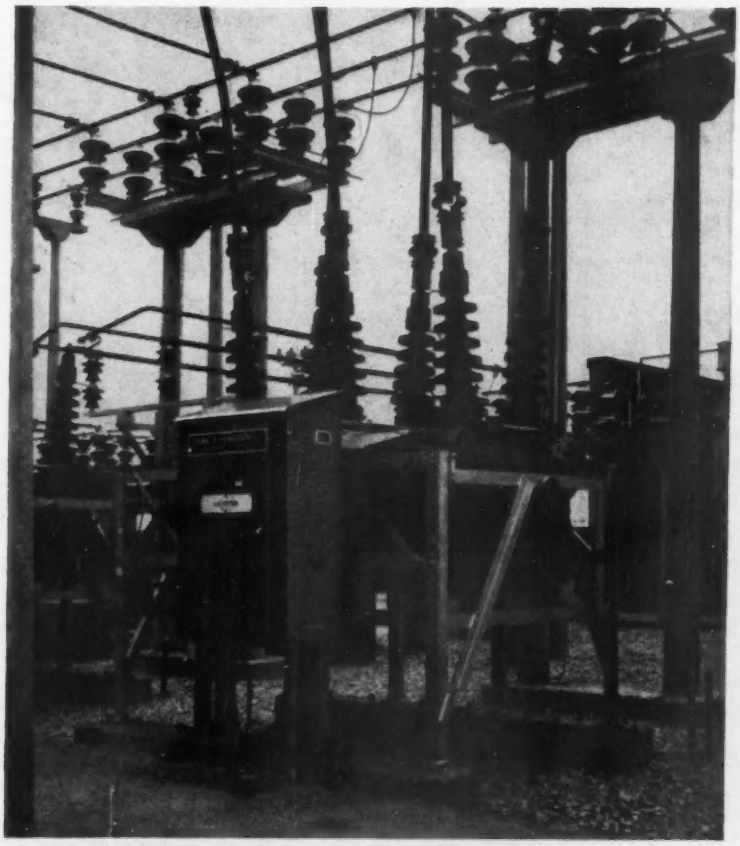

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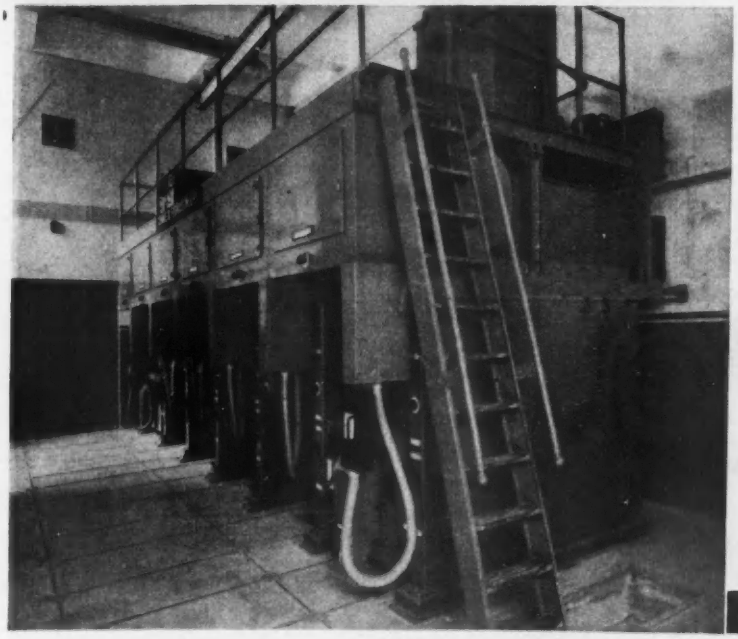

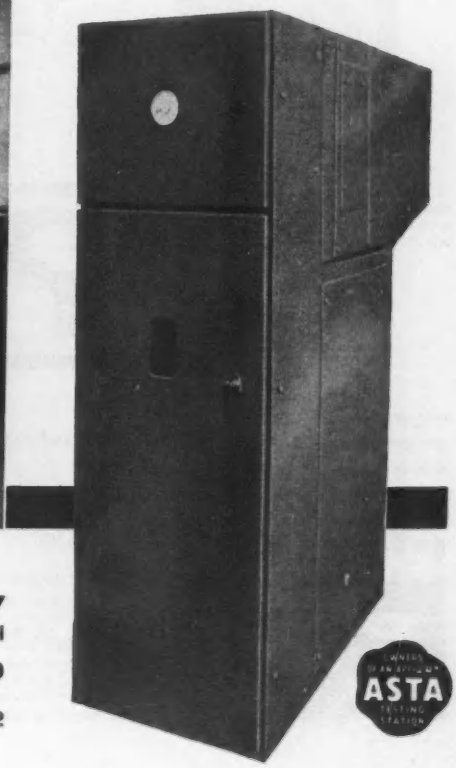

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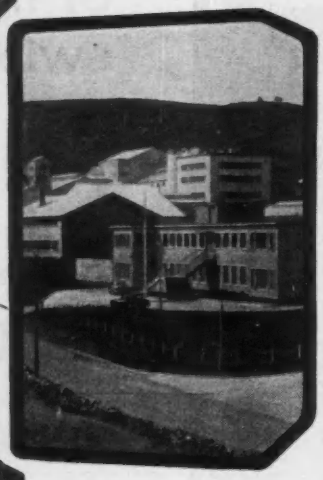

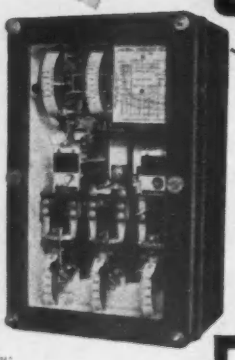

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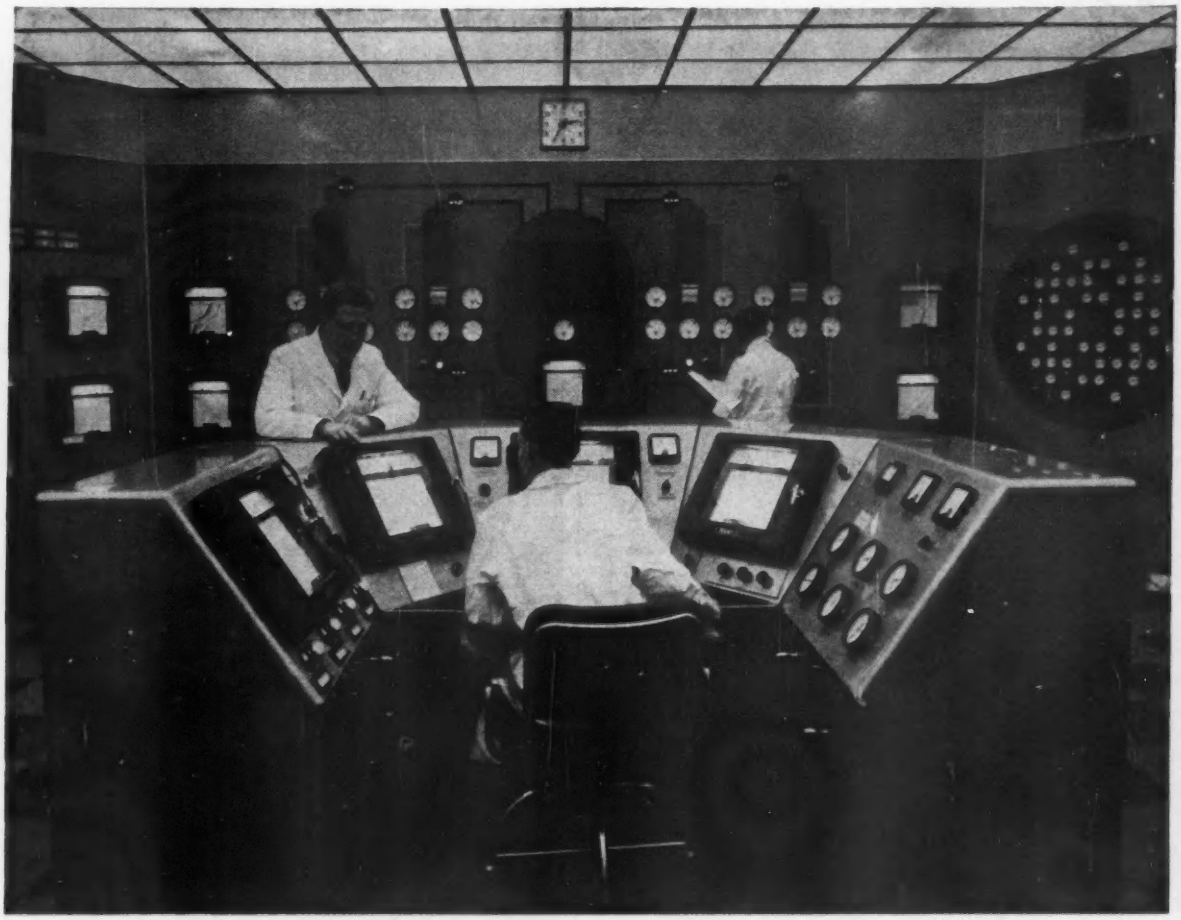

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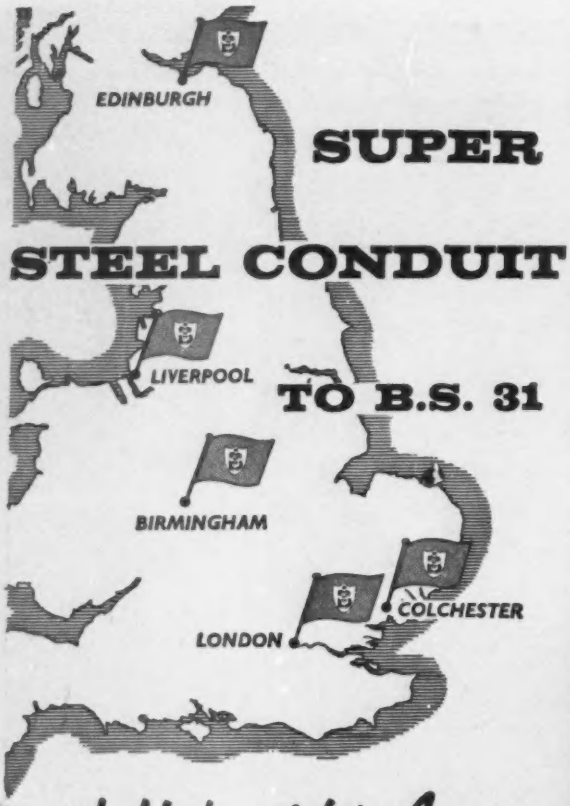

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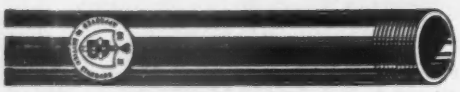

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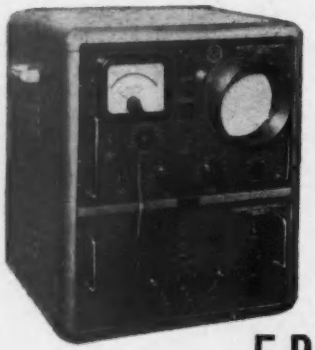

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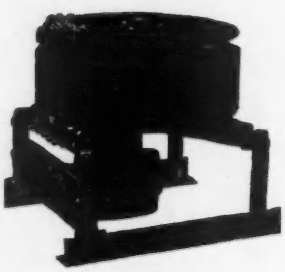

MODEL 50-B-GD
Output zero to 270 volts on 240 volts, 50 cycles. 20 amperes rated current.

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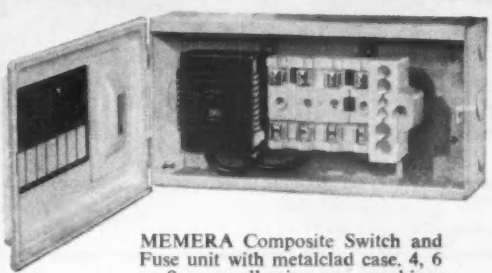
This aerial view shows the Lee Chapel area of the Basildon new town housing scheme, where MEM switch and fuse units and 13 amp. socket outlets were used exclusively. The extensive nature of this contract reflects the increasing use of MEM switchgear and accessories on the country's major housing projects.

The architects for this development were Messrs. Burles and Newton, and Messrs. Seymour Harris and Partners, in association with Mr. Anthony B. Davies, Chief Architect/Planner, Basildon Development Corporation. The electrical contractors were Messrs. Holiday, Hall and Stinson Limited.



MEMERA Composite Switch and Fuse unit with metalclad case. 4, 6 or 8 ways allowing any combination of 5, 15, 20 or 30 amp. fuses. Rewirable or H.R.C. cartridge fuse carriers.

MEM 13 amp. 3-pin socket outlet to B.S. 1363 with extra safe shutter design, moulded in brown or ivory.

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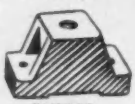

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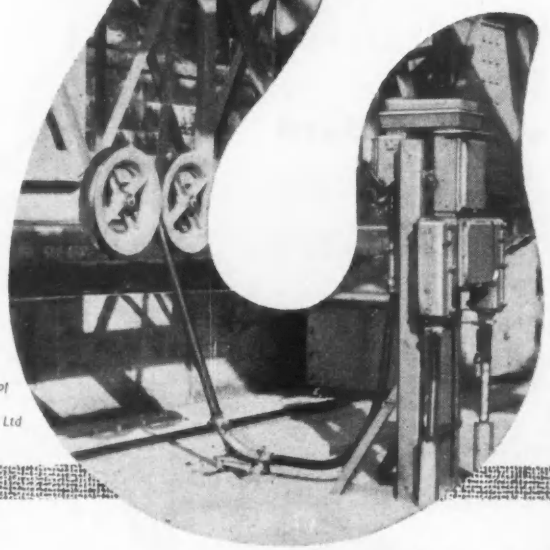
HH SWITCH AND PLUG UNIT



Photograph by courtesy of Swan Hunter & Wigham Richardson Ltd

HH ring-main distribution-point incorporating fused switch and plug unit feeding travelling dockside crane.

This new 60-ampere 550-volt switch-and-plug unit is capable of working continuously at full load in heavy industrial conditions such as are encountered in shipyards and docks.

SPECIFICATION

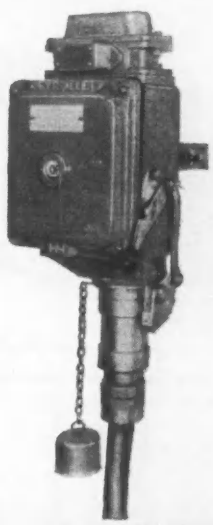
SWITCH: The latest Reyrolle HH design rated at 60 amperes 550 volts and capable of making and breaking current-surges of up to 360 amperes at 0·3 P.F.

PLUG AND SOCKET: A new addition to the Reyrolle "Easigo" range for industrial duty, available for D.P., T.P., or T.P. & N. service with scraping-earth connection.

INTERLOCKS: The switch cannot be closed with the plug withdrawn or the plug removed while the switch is 'ON'.

PROTECTION: An interlocked fuse-unit can be added if required.

Other switch-and-plug units of up to 300-ampere rating are also available.



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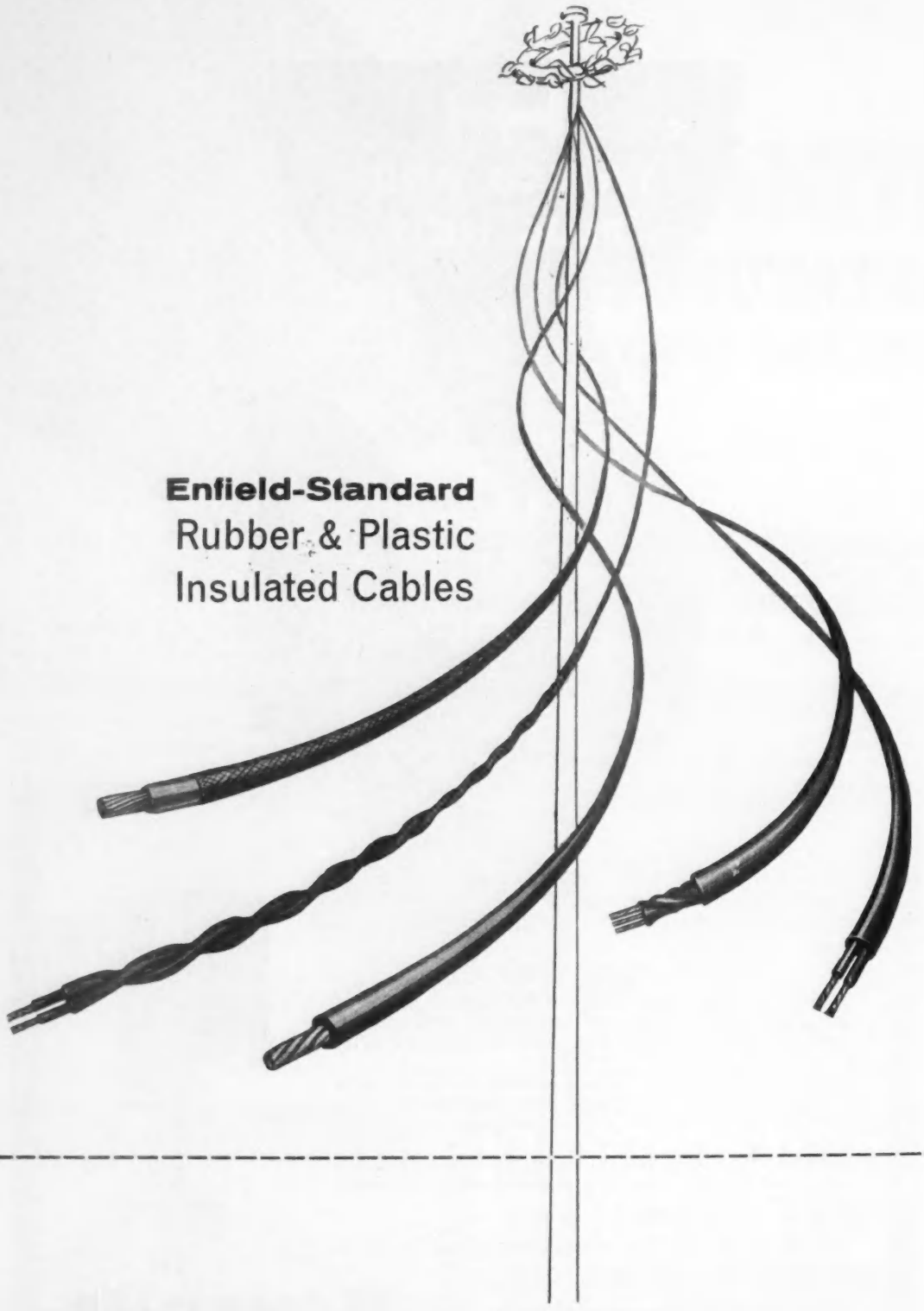

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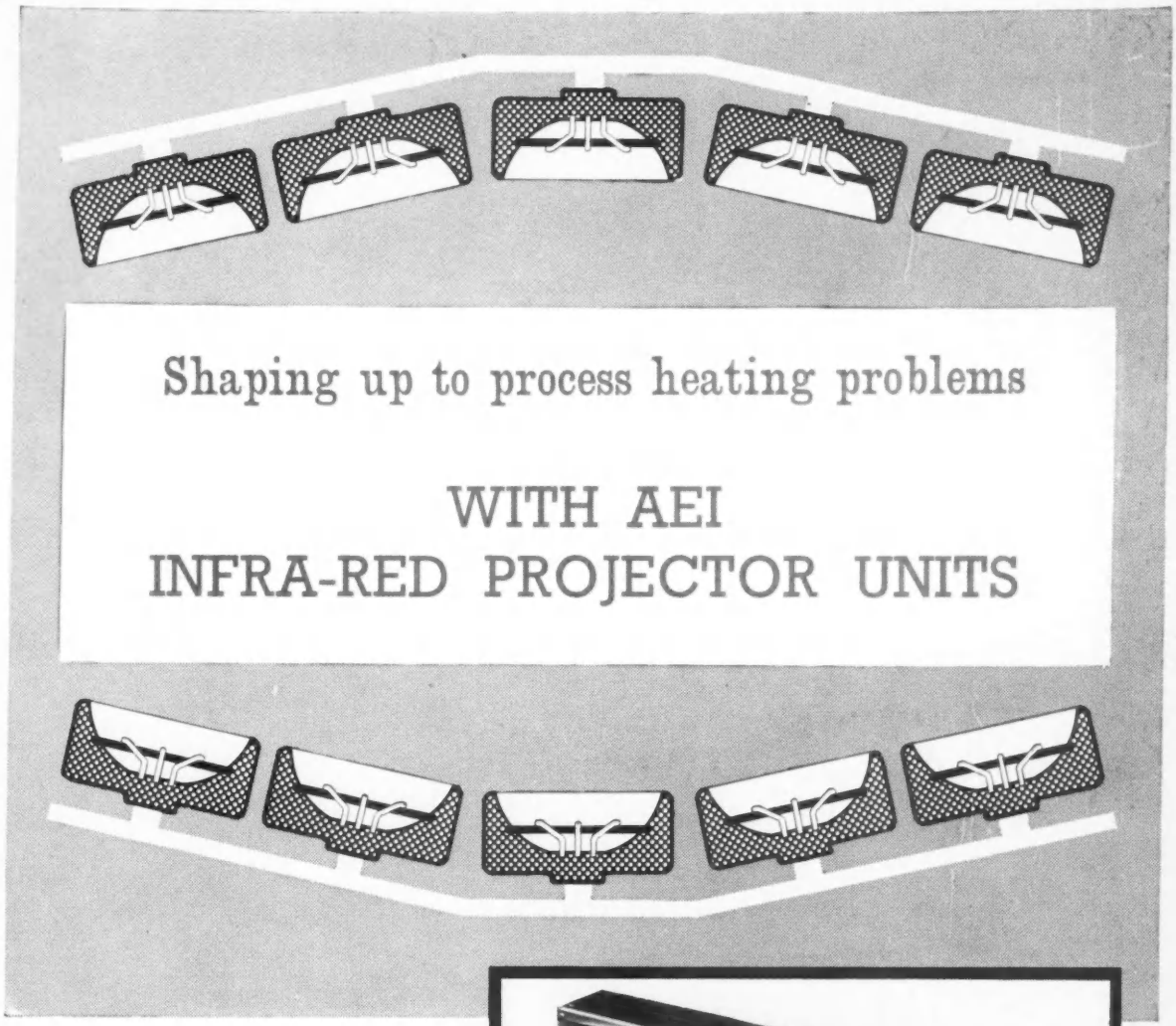

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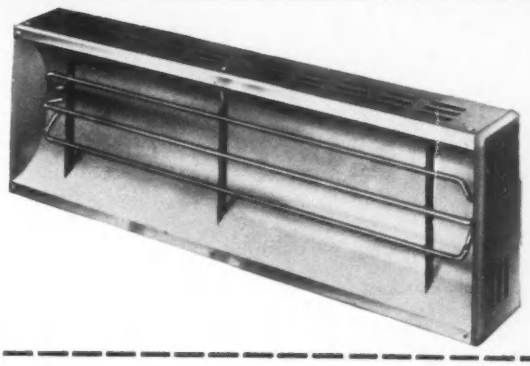

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